PATENT
ATTORNEY DOCKET No. 27459-803/767

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:

MOURA et al.

Application No. 08/703,767

Filed: August 27, 1996

For: HYBRID ACCESS SYSTEM UTILIZING CREDIT/DONE PROTOCOLS

Special Program Law Office,
Office of Petitions
Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

PETITION FOR
PRECAUTIONARY CHANGE TO LARGE ENTITY STATUS AND
PAYMENT OF LARGE ENTITY FEES UNDER 37 CFR §1.28(c)

The instant Petition is one of two petitions, being submitted concurrently, to effect a Precautionary Change to Large Entity Status and Payment of Large Entity Fees. The other petition is being submitted under 37 CFR § 1.137 (b). One of these petitions may be moot in view of the other.

As a precautionary measure, and without intentional delay, assignee respectfully requests a retroactive change to large entity status and hereby petitions the honorable Commissioner of

Patents and Trademarks to accept the large entity filing and prosecution fees for U.S. Application No. 08/703,767 ("the '767 application," Exhibit A). The Patent and Trademark Office had not held the '767 application to be abandoned, and assignee has not determined that a change in status is actually necessary. Assignee, however, has recently become aware of questions regarding claim construction and contract interpretation that may affect whether this patent application was entitled to small entity status when the filing and prosecution fees were paid.

SUMMARY

Assignee, Hybrid Networks, Inc. (Hybrid), has always had less than 500 employees. Represented by the corporate department of a first law firm, Hybrid executed a technology license agreement with a large corporation, having more than 500 employees, on November 30, 1993. (In this petition, this large corporation will be called ACME, though ACME is not the actual name of this corporation.) The agreement gave ACME a Right of First Refusal on sales of Hybrid assets and stock, and provided for licensing of certain Hybrid technology to ACME. At the time of execution, on November 30, 1993, Hybrid was relying on a second law firm for patent prosecution matters. Represented by the corporate department of the first law firm, Hybrid executed an amended and restated agreement, on December 22, 1995. Later, represented by a third law firm, Hybrid filed U.S. application serial no. 08/703,767, on August 27, 1996, with a small entity filing fee. On October 28, 1997, it was discovered that the agreement documents might have had a bearing on whether the '767 application was entitled to small entity status

when the filing fee was paid. By the instant petition, Hybrid submits the balance of the large entity filing fees, and the balance of other fees possibly incurred during the prosecution of the '767 application.

FACTS

Corporate Department of First Law Firm (Fenwick & West)
Counsels Hybrid in Negotiations and Agreement with ACME Corporation, while
Second Law First (Townsend & Townsend) Prosecutes Hybrid Patent Application

In 1993, ACME corporation wished to develop and market PC card products to provide users of personal computers with cable connectivity. To further that goal, ACME agreed to transfer money to Hybrid by way of a Technology License Agreement executed November 30, 1993 (portions attached to Declaration of Mr. Enns, Exhibit C).

ACME also owned various amounts of Hybrid's stock from time to time. At no time did Acme own greater than 17% of Hybrid's stock.

In the agreements, Hybrid licensed certain technologies, while reserving technologies related to the overall system. For example, Hybrid reserved technology related to its "Point of Presence" (PoP) system technology located at a central information distribution facility (e.g., a cable plant's head end) for providing an asymmetric network connection between the distribution facility and the remote users.

Hybrid and ACME envisioned an arrangement in which ACME would manufacture PC card devices for use in individual computers, paying Hybrid a per-unit royalty fee. As a precursor to this arrangement, the agreements set forth a per-unit royalty fee payment schedule.

The corporate department of Fenwick & West represented Hybrid in its dealing with ACME. Fenwick & West also had a patent department, but at this point Hybrid was still relying on Townsend & Townsend for patent prosecution matters and had not yet switched in representative matters before the Patent Office.

The November 30, 1993 agreement, executed by Hybrid President, Howard Strachman, was entitled TECHNOLOGY LICENSE AGREEMENT BETWEEN HYBRID NETWORK, INC. AND ACME CORPORATION, and was memorialized in 18 pages, including the following provision for a future agreement:

> 3.3 ... As a condition precedent to ACME's obligation to pay under Sections 3.2 and 3.3, Hybrid, with ACME's cooperation, shall engage in commercially reasonable development efforts as mutually agreed and defined by the Parties in a separate development agreement which the parties agree to negotiate in good faith and which shall include installment by Hybrid by of an agreed number of Point of Presence Systems.

The agreement included the following provisions for the purchase of Hybrid assets and stock by ACME:

> 13.0 ACME RIGHT OF FIRST REFUSAL
>
> 13.1 If Hybrid decides to (i) sell itself, merge, consolidate, sell all, or substantially all of its assets, or (iii) issue, sell or exchange, for cash or other consideration, shares of its capital stock (each a "Corporate Event"), the result of which will be a change in control of Hybrid. Hybrid shall give ACME a detailed, written description of the terms of the proposed Corporate Event at lease forty-five (45) days prior to the completion of the Corporate Event (the "Notice).

13.2 Upon receipt of the Notice, ACME shall have the right, exercisable by giving written notice to Hybrid within thirty (30) calendar days after the date of delivery of the Notice, to enter into an agreement with Hybrid to participate in the Corporate Event on terms consistent with and no less favorable to Hybrid than those contained in the Notice. If the consideration contained in the Notice incudes property other than cash, ACME shall have the option to substitute similar property of equal value. The value of any property included in the purchase price shall be the fair market value of such property on the date ACME receives the Notice. In the event of a disagreement between the Parties, the fair market value of property shall be jointly determined by a nationally recognized investment firm selected by each Party to this Agreement. If the firms selected by ACME and Hybrid are unable to agree upon the value of property, the firms shall promptly select a third firm whose determination shall be conclusive. Each party shall bear the cast of its own investment banking firm and shall share equally the cost of any third firm selected hereunder. If ACME exercises its right to purchase under this Section 13.0, the transactions shall (I) be subject to the receipt of all applicable regulatory approvals, (ii) be in compliance with applicable laws and regulations, and (iii) take place on such date and at such time and place as Hybrid and ACME shall mutually agree, provided that in no event will such date be later than forty-five (45) days after the date of the Notice.

13.3 If ACME decides not to participate in the Corporate Event as detailed in the Notice, Hybrid may complete the corporate Event as detailed in the Notice. If the terms and conditions of the Corporate Event materially change after expiration of ACME's rights under Paragraph 13.2 and such terms are more favorable than those first detailed in the Notice, Hybrid must inform ACME in writing of such changes and ACME shall have the right, within ten (10) workings days of receiving such notification from Hybrid to agree to complete within thirty (30) days after such notification, the Corporate Event on the changed terms and conditions specified in Hybrid's notification to ACME.

13.4 ACME shall maintain the right of first refusal under this Section 13.0 during the Exclusivity Period. ACME's right of first refusal shall continue after expiration or termination of the Exclusivity Period for the earlier of (I) two (2) years, provided ACME holds at least ten percent (10%) of Hybrid's outstanding shares of stock at the time of the Corporate Event of (ii) an initial public offering by Hybrid

The agreement also included the following license grant provisions:

1.5 "Hybrid Software" shall mean Hybrid's client software, in source and binary form, to be installed on a user's computing device which permits symmetrical/asymmetric data communications between the user's personal computer or

other computing device and a cable television of other communications network. **A Point of Presence System shall not be included in the term "Hybrid Software."**

1.6 "Hybrid Technology" shall mean Hybrid's designs, processes, methods, software, algorithms, trade secrets, and its patents, copyrights, and other ACME intellectual property rights **used in or necessary for** Hybrid Software and/or the Remote Link Adapter with respect to enabling symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network.

1.7 **"Point of Presence System" shall mean a central network point for the collection of digital information from various information providers and users and the distribution of digital information to the cable television head-end equipment.**

1.9 "Remote Link Adapter" shall mean a device that uses software and/or hardware to physically connect a personal computer or other computing device to a television cable or other communications network and which is capable of executing Hybrid Software. **A Point of Presence System shall not be included in the term "Remote Link Adapter."**

. . .

2.0 LICENSE GRANT

2.1 Subject to the terms of this Agreement, hybrid grants to ACME a perpetual, worldwide, exclusive (as defined in Section 2.4), royalty bearing license, with the right to sublicense during the Exclusivity Period (as defined in Section 2.4), to use Hybrid Technology . . .

2.2 Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, exclusive (as defined in Section 2.4), royalty free license, with the right to sublicense, during the Exclusivity Period (as defined in Section 2.4) under Hybrid's copyrights, patents, and trade secrets to reproduce copies of Hybrid Software . . .

2.5 **Except as expressly provided herein, no other rights or licenses of any kind are granted by the Parties**. . . .

(emphasis added)

The first Agreement is Amended and Restated

On December 22, 1995, Hybrid's Vice President, Richard E. Fuller, executed a document entitled AMENDED AND RESTATED TECHNOLOGY LICENSE AGREEMENT BETWEEN HYBRID NETWORKS, INC. AND ACME, which included the following provisions:

THEREFORE, ACME and Hybrid agree as follows:

I. Definitions

1.1. *"Hybrid Documentation"* shall mean written Hybrid specifications, schematics, and associated technical documentation for the Remote Link Adapter and Hybrid Software.

1.2 *"Hybrid Improvement"* shall mean any enhancement, feature, or option for use by or in connection with Hybrid Technology or the ACME Technology developed by Hybrid which is intended to, or which does, improve Hybrid Technology or the ACME Technology.

1.3 *"Hybrid Product"* shall mean a product developed by or for Hybrid which incorporates ACME Technology. ACME Improvement or any other derivative thereof.

1.4 *"Hybrid Software"* shall mean Hybrid's client software, in source and binary forms, to be installed on a user's computing device which permits symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network. **A Point of Presence System shall not be included in the term "Hybrid Software."**

1.5 *"Hybrid Technology"* shall mean Hybrid's designs, processes, methods, software, algorithms, trade secrets, and its patents, copyrights, and other ACME intellectual property rights **used in or necessary for** Hybrid Software and/or the Remote Link Adapter with respect to enabling symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network. Hybrid Technology shall include any Hybrid improvements required to be delivered to ACME hereunder.

1.6 *"ACME Documentation"* shall mean written ACME specifications, schematics, and associated technical documentation for the ACME Technology.

1.7 *"ACME Improvement"* shall mean any enhancement, feature, or option for use by or in connection with ACME Technology or the Hybrid Technology developed by

ACME which is intended to, or which does, improve ACME Technology or the Hybrid Technology.

1.8 *"ACME Product"* shall mean a product developed by or for ACME which incorporates Hybrid Technology, Hybrid Improvement or any other derivative thereof.

1.9 *"ACME Software"* shall mean the "ACME Client Software Modifications," the "ACME [redacted] Client Software" and the "ACME [redacted] Software," as each is defined in Exhibit A, in source and binary forms.

1.10 *"ACME Technology"* shall mean the portions of the ACME Technology Deliverables that were developed by ACME. The ACME Technology shall not include those portions of the ACME Technology Deliverables that incorporate any of the Hybrid Technology. The ACME Technology shall include (without limitation) the "ACME [redacted] Software" as defined in Exhibit A.

1.11 *"ACME Technology Deliverables"* shall mean the ACME Software and the "ACME [redacted] Client Hardware" as defined in Exhibit A. The ACME Technology Deliverables shall include the ACME Improvements required to be delivered to Hybrid hereunder. ACME acknowledges that the ACME Technology Deliverables incorporate portions of the Hybrid Technology.

1.12 ***"Point of Presence System"* shall mean a central network point for the collection of digital information from various information providers and users and the distribution of digital information to the cable television head-end equipment for a specific geographic area.**

1.13 *"Remote Link Adapter"* shall mean a device that uses software and/or hardware to physically connect a personal computer or other computing device to a television cable or other communications network and which is capable of executing Hybrid Software. **A Point of Presence System shall not be included in the term "Remote Link Adapter."**

2. LICENSE GRANTS

2.1 Hybrid Technology. Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, nonexclusive, royalty bearing license to use Hybrid Technology to design, develop, modify, create derivatives, manufacture, have manufactured, use, marker, distribute, sell, service and support ACME Products. ACME shall not sublease any Hybrid Technology. These licenses include the right to copy, modify, and distribute Hybrid Documentation.

2.2 Hybrid Software. Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, nonexclusive, royalty-free license, under Hybrid's copyrights, patents, and trade secrets, to reproduce copies of Hybrid Software in order to prepare derivative works of such Hybrid Software ("*ACME Derivative Code*") and to copy, publish, and distribute, under ACME's then current standard licensing terms, Hybrid Software and ACME Derivative Code in binary form. ACME shall not sublease Hybrid Software or ACME Derivative Code in source code form. These licenses include the right to copy, modify, and distribute Hybrid Documentation.

2.3 ACME Technology. Subject to the terms of this Agreement, ACME grants to Hybrid a perpetual, worldwide, nonexclusive, royalty-free, paid-up license to use ACME Technology to design, develop, modify create derivatives, manufacture, have manufactured, use, market, distribute, sell, service and support Hybrid Products. Hybrid shall not sublicense ACME Technology. These licenses include the right to copy, modify, and distribute ACME Documentation.

2.4 ACME Software. Subject to the terms of Agreement, ACME grants to Hybrid a perpetual, worldwide, nonexclusive, royalty-free license, under ACME 's copyrights, patents, and trade secrets, to reproduce copies of ACME Software in order to prepare derivative works of such ACME Software ("*Hybrid Derivative Code*") and to copy, publish, and distribute, under Hybrid's then current standard licensing terms, ACME Software and Hybrid Derivative Code in binary form. Hybrid shall not sublicense ACME Software or Hybrid Derivative Code in source code form. These licenses include the right to copy, modify, and distribute ACME Documentation.

2.6 Distribution in Devices. Notwithstanding the software licenses restrictions specified in this Section 2, each party shall have the right to distribute software or portions thereof which are programmed into a semiconductor device without a license agreement but will rely on such laws as may be appropriate.

2.7 Reserved Rights ... **Except as expressly provided herein, no other rights or licenses of any kind are granted by the parties.**

4. OWNERSHIP

4.1 Hybrid Ownership. Except for the licenses expressly granted in Section 2 above, Hybrid will remain the owner of all right, title and interests in the Hybrid Technology, Hybrid Software, Hybrid Documentation and any and all copyright, trade secret, patent and other intellectual property rights therein. Except for ACME's ownership of the ACME Technology, Hybrid will remain the owner of all right, title and interest in the

Hybrid Products, Hybrid Improvements and any and all copyright, trade secret, patent and other intellectual property rights therein.

4.2 ACME Ownership. Except for the licenses expressly granted in Section 2 above, ACME will remain the owner of all right, title and interest in the ACME Technology, ACME Documentation and any and all copyright, trade secret, patent and other intellectual property rights therein. Except for Hybrid's ownership of the Hybrid Technology, ACME will remain the owner of all right, title and interest in the ACME Products, ACME Technology Deliverables, ACME Improvements and any and all copyright, trade secret, patent and other intellectual property rights therein ...

6. DEVELOPMENT, DELIVERY, MAINTENANCE AND SUPPORT

6.1 Hybrid Deliverables. Hybrid has delivered to ACME Hybrid Technology including but not limited to (i) all source code, "make files," and related Hybrid Documentation needed to recreate the executable version of the Hybrid Software, and (ii) the functional, electrical, mechanical and test specifications, logic and wiring diagrams, physical layout diagrams, and bill of materials for the Remote Link Adapter.

6.2 Hybrid Improvements. Hybrid will furnish to ACME, in a form reasonably satisfactory to ACME and at no additional expense to ACME, only such Hybrid Improvements to Hybrid Technology as Hybrid shall have developed that maintain basic functionality, including cable back-channel capability. If Hybrid makes available to any third party the right to sell, lease, license or distribute any Improvement that increases functionality with respect to any ACME Product then marketed by ACME , Hybrid will furnish such improvement to ACME under terms and conditions as favorable as those offered by Hybrid to any such party.

6.3 ACME Deliverables. On or about the Effective Date and as otherwise agreed herein, ACME will deliver to Hybrid the ACME Technology Deliverables in the form of mutually agreed technology release packages including but not limited to (I) all source code, "make files," and related ACME Documentation needed to recreate the executable version of any software delivered, and (ii) the functional, electrical, mechanical and test specifications, logic and wiring diagrams, physical layout diagrams, and bill of materials for hardware delivered.

10. MARKETING AND FUTURE BUSINESS OPPORTUNITIES

10.1 Marketing Names. ACME shall have the right to promote and market Hybrid Technology under ACME's trade names, and Hybrid shall have the right to promote and market ACME Technology under Hybrid's trade names.

10.4 [redacted] Development Plan. During the sixty (60) days following the Effective Date, the parties will prepare a development plan relating to the [redacted] technology and will negotiate in good faith the terms and conditions of a Development Agreement under which such development will occur. If the parties do not develop such a development plan or enter into such a Development Agreement, ACME will deliver to Hybrid in accordance with Section 6.3 any ACME Improvements developed by ACME and on July 1, 1996, ACME will make an additional delivery to Hybrid of any ACME Improvements. Further, on July 1, 1996 and as otherwise agreed, if the parties enter into a Development Agreement, ACME will deliver to Hybrid any deliverables developed hereunder. Neither party will have liability whatsoever, and neither party will be considered to have breached this Agreement, for failure to prepare a development plan or enter into a Development Agreement.

13.1 If Hybrid decides to (I) sell itself, merge, consolidate, sell all, or substantially all of its assets, or (iii) issue, sell or exchange, for cash or other consideration, shares of its capital stock (each a "Corporate Event"), the result of which will be a change in control of Hybrid. Hybrid shall give ACME a detailed, written description of the terms of the proposed Corporate Event at least forty-five (45) days prior to the completion of the Corporate Event (the "Notice").

13.2 Upon receipt of the Notice, ACME shall have the right, exercisable by giving written notice to Hybrid within thirty (30) calendar days after the date of delivery of the Notice, to enter into an agreement with Hybrid to participate in the Corporate Event on terms consistent with and no less favorable to Hybrid than those contained in the Notice. (emphasis added)

The Amended and Restated Agreement is Amended by Letter

In a letter dated, February 26, 1996, signed by Hybrid's President, Carl. S. Ledbetter, the December 1995 Restated and Amended Agreement was amended as follows:

The first two sentences of Section 10.4 shall be deleted and the following sentences shall be substituted in their place:

The parties will prepare a development plan based upon such product specifications as may be mutually agreed upon by the [redacted] Team consisting of Hybrid, ACME, Beta Corporation and Delta Corporation. The parties to the Agreement agree to negotiate in good faith the terms and conditions of a Development Agreement under which such development will occur. Hybrid has received in accordance with Section 6.3 any ACME Improvements developed by ACME as of the Effective Date. On July 1, 1996 ACME will make additional delivery to Hybrid of any ACME Improvements developed by ACME subsequent to the Effective Date.

(The paragraph above employs the names BETA and DELTA to identify two other large corporations, though BETA and DELTA is not the actual name of these corporations.)

Cushman, Darby & Cushman Files '767 application

On August 27, 1996, the firm of Cushman, Darby, and Cushman filed the '767 application (Exhibit A) under 37 CFR § 1.60 with a small entity filing fee. The '767 application referenced U.S. application Serial No. 08/426,920 ("the '920 application") as the parent application (See page 2 of the Rule 60 request in Exhibit A). As required by 37 CFR § 1.60, the '767 application included a copy of the parent application.

The '767 application claimed small entity status (See page 2 of the Rule 60 request in Exhibit A), referencing a small entity statement (Exhibit B) filed in the '920 application. This small entity statement had been executed, for the '920 application, by Mr. Richard E. Fuller, then Hybrid's Vice President of Finance, on April 21, 1995.

The copy of the parent application, required in the'767 application, was entitled ASYMMETRIC HYBRID ACCESS SYSTEM AND METHOD, and included 12 independent claims and 25 total claims (Exhibit A), including claim 22:

> 22. A method of operating a client node, comprising the steps of:
> sending periodic operability indication messages during an active state,
> receiving a poll message, and requesting channel connection.

The Rule 60 request cancelled claim 22 (See page 3 of the Rule 60 request in Exhibit A).

In an office action dated January 10, 1997, the examiner objected to the claims, and rejected the claims under 35 U.S.C. §§ 101, 102, and 103. In a responsive amendment filed May 19, 1997, Hybrid's current representative amended the specification and the claims. The amendment was accompanied by a small entity two-month extension of time fee of $190.00, an extra independent claim fee of $234.00 for 6 extra independent claims, and an extra total claim fee of $77.00 for 7 extra total claims.

Questions Regarding Small Entity Status Discovered

Over the past few months, Hybrid's current representative (who had no knowledge of any of the prior license agreements) had been consulted relative to licensing its technology to ACME in connection with ACME's prospective sale of a business unit dealing with Hybrid's technology. Upon considering the proper status of Hybrid as a small entity in handling of its

application, the current representative on or about October 28, 1997 inquired of Hybrid whether the ACME licensing deal had gone through. Mr. Rick Enns, Hybrid's Vice President of Engineering, informed the current representative that it had not, but, during the discussions, it was learned for the first time by the current representative that the recent negotiations with ACME were based on an earlier agreement, to wit: the November 30, 1993 agreement and amendments thereto. We then requested that Mr. Enns forward to us by facsimile a copy of the November 30, 1993 agreement for review and analysis. On November 17-18, we visited Hybrid in Cupertino, California to explore further the nature of the relationship between Hybrid and ACME and then learned that the November 30, 1993 agreement had been restated and modified by an agreement executed December 22, 1995, and again modified by a letter dated February 26, 1996.

Conclusion

We have reviewed the various agreements, and the claims, and believe certain questions might arise as to the status of Hybrid as a small entity at various times during the prosecution of its patent applications. Although we draw no legal conclusions, we perceive certain questions relative to (i) whether a large corporation had "control" at the time of payment of the filing fee on August 27, 1996; (ii) whether the November 30, 1993 agreement conveyed (currently or prospectively) any rights to "patents" since none were issued at that time; (iii) whether definitions contained in the agreement precluded that subject matter of the patents as licensed

technology; and (iv) whether the December 26, 1995 restated and modified Technology License Agreement impacted the small entity status determination.

Regarding similar questions in another one of Hybrid's patents, rather than risk any subsequent adverse determination of other questions, and without admitting error in payment of the small entity issue fee, Hybrid, as a precautionary measure, filed a set of Petitions on November 28, 1997, advising of a change in status to a large entity and submitting the balance of the large entity issue fee.

Regarding similar questions in U.S. Patent No. 5,586,121, which issued from the '920 application, rather than risk any subsequent adverse determination of other questions, and without admitting error in payment of the small entity issue fee, Hybrid, as a precautionary measure, filed a set of Petitions on December 19, 1997, advising of a change in status to a large entity and submitting the balance of the large entity filing and issue fees.

Regarding similar questions in five other Hybrid applications, rather than risk any subsequent adverse determination of other questions, and without admitting error in payment of the small entity issue fee, Hybrid, as a precautionary measure, filed a set of Petitions on December 29, 1997, two sets of petitions on December 31, 1997, a set of Petitions on January 13, 1998, and a set of petitions on January 20, 1998, advising of a change in status to a large entity and submitting the balance of the large entity filing and prosecution fees.

Regarding the subject of the instant petition, Hybrid's '767 application, rather than risk any subsequent adverse determination of these questions and without admitting error in payment

of the small entity filing or prosecution fees, Hybrid, as a precautionary measure, now advises of a change in status to a large entity and submits payment of a large entity filing and prosecution fees.

Any error that might have been made, in verifying whether the '767 application was entitled to small entity status, arose from inadvertence, the complexity of the business situation, and/or changes in legal representation.

Whether ACME's Right of First Refusal and stock ownership constituted control, within the meaning of 37 CFR 1.9 (d) and MPEP 509.02, depends on construction of the regulations of the Small Business Administration. Although assignee is unaware of any decision directly on point, assignee believes ACME had no right to control within the meaning of those regulations.

Whether Hybrid had an obligation to license, within the meaning of MPEP 509.02, depends on issues of contract interpretation and claim construction. The 1993 agreement defines Hybrid Technology to mean Hybrid's designs, processes, methods, software, algorithms, trade secrets, and its patents, copyrights, and other intellectual property rights . . ." Under the agreement, ACME's right to "use" Hybrid Technology appears to be limited to that which is "used in or necessary for Hybrid Software and/or the Remote Link Adapter (paragraph 1.6). Paragraph 1.9 defines Remote Link Adapter and states, "a Point of Presence system shall not be included in the term 'Remote Link Adapter.' " Depending on how claim 22 would have to be interpreted, had it not been cancelled, the method of claim 22 may, or may not, "be used in or necessary for" the "Remote Link Adapter," within the meaning of the 1993 Agreement.

Regardless of the proper interpretation of the claim 22, and the 1993 Agreement, a non lawyer might have been lulled because the specification states, "FIG. 2a is a schematic drawing of a point of presence (POP) system 26(1) according to the present invention." (Specification page 12, lines 23-24, in Exhibit A).

Thus, in view of varied interpretations under contract law, patent law, and the regulations of the Small Business Administration, it would not be readily apparent whether Hybrid had licensed claimed or patented subject matter, or had an obligation to license such matter, or whether ACME had control over Hybrid, within the meaning of MPEP 509.02 and the regulations cited therein.

Assignee respectfully submits that the forgoing statement, of how possible small entity issues may have been overlooked and how the issues were discovered, meets the requirements of 37 CFR § 1.28(c) and hereby requests that Deposit Account No. 06-0115, of Farkas & Manelli, PLLC, be charged $960.00 (This amount, $960.00, is the large entity filing fee, plus the large entity extension and extra claim fees possibly incurred May 19, 1997, minus the $375.00 small entity filing fee paid on August 27, 1996 (See page 4 of the Rule 60 request in Exhibit A), the $190.00 two-month extension fee, $234.00 extra claim fee, and the $77.00 extra independent total claim fee paid June 6, 1997.

The large entity filing fee, based on the fee schedule effective on the date of the instant petition, is $790.00.

The large entity extension fee possibly incurred May 19, 1997, based on the fee schedule effective on the date of the instant petition, is $400.00 for a 2 month extension of time.

The large entity extra independent claim fee possibly incurred May 19, 1997, based on the fee schedule effective on the date of the instant petition, is $492.00 for 6 extra independent claims.

The large entity extra total claim fee possibly incurred May 19, 1997, based on the fee schedule effective on the date of the instant petition, is $154.00 for 7 extra total claims.

Thus, $960.00 = ($790.00 - $375.00) + ($400.00 - $190.00) +

($492.00 - $234.00) + ($154.00 - $77.00), and

$960.00 = $415.00 + $210.00 + $258.00 + $77.00.

Exhibit C is the unexecuted declarations of Frederick Enns, supporting facts relied upon in this petition. An executed version of Exhibit C will be submitted to the Office when it becomes available.

The foregoing is not intended as an admission of any mistake in declaring small entity status, but is merely a precautionary measure.

If there are any fees required for consideration of this document, or for any other reason, please charge such fees to the Farkas & Manelli, PLLC Deposit Account No. 06-0115.

Respectfully submitted,

FARKAS & MANELLI, PLLC

By 
Jerome D. Jackson
Reg. No. 33,186
Tel: (202) 778-1130
Fax: (202) 887-0336

DATE: 1/21/98

Farkas & Manelli PLLC
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Washington, DC 20036

TABLE OF EXHIBITS

EXHIBIT A	U.S. Application No. 08/703,767
EXHIBIT B	Small Entity Statement filed in Parent Application
EXHIBIT C	Enns Declaration, with portions of Agreements dated November 30, 1993, and December 22, 1995, and of Letter dated February 26, 1996
EXHIBIT D	Cover sheet for amendment filed May 19, 1997

EXHIBIT A

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REQUEST FOR FILING
(RULE 60)

For Design or Utility Applications

Rule 60 PATENT APPLICATION: (DO NOT USE FOR CIPs)

[ ] Continuation)
) application under 37 CFR 1.60
[X] Divisional)

of pending prior application of

Inventor(s): Eduardo J. MOURA and Jan M. GRONSKI

Appln. No. 08/426920
series code ↑ ↑ serial no.
Filed: April 21, 1995

Title: ASYMMETRIC HYBRID ACCESS SYSTEM AND METHOD

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

Group Art Unit: 2603

Examiner: S. Hom

Atty Dkt: 225019
New M# / Client Ref.

(Our Deposit Account No. 03-3975
(Our Order No. 7225 / 225019
C# / New M#

Date: August 27, 1996

(Parent Matter No. 217537)

Sir:

To effect the above-requested filing today:

1. **Attached** is a true copy **(which must be filed)** of the prior application as **originally** filed, including:

[X] Abstract
[X] Specification and claims (unamended clean copy) as originally filed (40 pages) **(must be attached)**
[X] Drawings **(must be attached if originally filed):** 20 sheet(s)/set: [X] 1 set informal;
[ ] Formal of size [ ] A4 [ ] 13" [ ] 14"

1A. Always X one box, only:
1. [X] Signed declaration or oath as originally filed in prior application attached
2. [ ] NO Declaration or fee is enclosed; this is a filing under Rule 60(d).

NOTE: No amendments (if any) referred to in the Oath/Declaration filed to complete the prior application introduced new matter.

2. [ ] This Rule 60 application is hereby filed by less than all of the inventors named in the prior application. Petition is hereby made requesting deletion as inventor(s) of the following who is/are **not** inventor(s) of the invention being claimed in this Rule 60 application:

1. _____ 2. _____
3. _____ 4. _____
5. _____ 6. _____
7. _____ 8. _____
9. _____ 10. _____

3. (RESERVED)

4. [ ] Priority is claimed under 35 U.S.C. 119/365 based on filing in _____ of (country)

	Application No.	Filing Date	Application No.	Filing Date
(1)			(4)	
(2)			(5)	
(3)			(6)	

a. [ ] _____ (No.) Certified copy/copies attached.
b. [ ] Certified copy/copies previously filed on _____ in U.S. Application No. ___/_____, filed on _____.
series code ↑ ↑ serial no.
c. [ ] Certified copy/copies filed during International stage of PCT/_____/_____.
d. [ ] Priority is also claimed from PCT/_____/_____ filed _____.

5. [X] Prior application is assigned to Hybrid Networks, Inc.

by Assignment recorded April 21, 1995 (Date) Reel 7493 Frame 0486.

6. [ ] Attached is an Assignment and Cover Sheet.

Please return the recorded Assignment to the undersigned.

7. [X] The power of attorney in the prior application is to Lawrence Harbin, Reg.No. 27,644, Cushman Darby & Cushman, L.L.P.
(Name and Reg. No.)
whose current address is as in item 8 below.

a. [ ] The power appears in the original papers of the prior application.

b. [X] Since the new power does not appear in the original papers, a copy of the power in the prior application is attached.

c. [ ] Recognize as associate attorney _____.
(Name, Reg. No. and Address)

8. Address all future communications to Cushman Darby & Cushman, LLP. Ninth Floor, East Tower 1100 New York Avenue, N.W., Washington, D.C. 20005-3918.

9. Amend the specification by inserting before the first line the sentence:--This is a
[ ] continuation [X] division of Application No. 08 /426,920, filed April 21, 1995
series code ↑ ↑ serial no.
.--

10. [X] 1(No.) Verified Statement(s) establishing "small entity" status under Rules 9 & 27
[X] filed in above prior application (and hence applicable hereto)
[ ] attached.

11. Petition to extend the life of the above prior application to at least the date hereof
(One box) [ ] is being concurrently filed in that prior application (Use Form CDC-111).
(must be) [ ] was previously filed in that prior application (Check length of prior extension).
(X'd) [ ] is not necessary for copendency (**Double check** before X'ing this box).

12. [X] **INFORMATION DISCLOSURE STATEMENT:** Attached is Form PTO-1449 listing all of the documents cited by Applicant and the PTO in the parent application(s) relied upon under 35 USC 120 and referenced in item 9 above. Per Rule 98(d) copies of those documents are not required now. Please consider those documents and advise that they have been considered in this new application as by returning a copy of the enclosed Form PTO-1449 with the Examiner's initials in the left column per MPEP 609.

13. [ ] Attached is a Rule 103(a) Petition to Suspend Action.

14. **[X]** **PRELIMINARY AMENDMENT to be entered before fee calculation**: (Do not make amendments here except for correction of improper multiple dependencies or cancellation of whole claims or multiple dependencies for purpose of reducing the filing fee per MPEP §§ 506 and 607; do not cancel all claims).

Cancel claims 1-20 and 22-25 without prejudice or disclaimer.

FILING FEE

THE FOLLOWING FILING FEE IS BASED ON

->->->->CLAIMS AS FILED AND **CHANGED BY PRELIMINARY AMENDMENT IN ITEM 14**<-<-<-<-

NOTE: If box 1A2 is X'd, do not pay fees, but leave lines 15-22 and 27-32 blank. see box 10 re: Large/Small Entity

							Fee Code
15. Basic filing fee					Design Appln. ($310/$155)	$	(106/206)
16. Basic filing fee					Not Design Appln. ($750/$375)	$ 375.00	(101/201)
17. Total Effective Claims	1	minus	20 =	* 0	x $22/$11	= + -0-	(103/203)
18. Independent Claims	1	minus	3 =	* 0	x $78/$39	= + -0-	(102/202)

*If answer is zero or less, enter "0"

19. If any proper (ignore improper) multiple dependent claim remains, add	$250/$125	+ -- (104/204)
20.	Subtotal	$ 375.00
21. If "petition" box 13 above is X'd,	add petition fee ($130.00)	+ -- (122)
22.	**TOTAL FILING FEE ATTACHED**	$ 375.00 (carry forward to Item 31)

23. [X] ATTACHED:

SUPPLEMENTAL DECLARATION
CERTIFICATE UNDER 37 CFR 3.73(b)

24. [X] Preliminary Amendment attached (to be entered after assigning Appln. No.)

25. [X] The following PRELIMINARY AMENDMENT is to be entered after assigning Appln. No.:

(PRELIMINARY AMENDMENT is attached)

26. **ADDITIONAL FEE CALCULATION FOR PRELIMINARY AMENDMENT PER BOXES 24/25**

	Claims remaining after amendment		Highest number previously paid for		Present Extra		Large/Small Entity	Additional Fee	Fee Code
27. Total Effective Claims	* 4	minus	** 20	=	0	x	$22/$11	= $ -0-	(103/203)
28. Independent Claims	* 3	minus	*** 3	=	0	x	$78/39	= + -0-	(102/202)

29. If amendment enters proper multiple dependent claim(s) into this application for first time, add (per application) - $250/125 + -- (104/204)

30. ADDITIONAL FEE $ -0-

31. plus FEE from item 22 on page 3 + 375.00

32. TOTAL FEE ATTACHED $ 375.00

33.*If the entry in this space is less than entry in the next space, the "Present Extra" results is "0".

34.**If the "Highest number previously paid for" (see item 16 above) is less than 20, write "20" in this space.

35.***If the "Highest number previously paid for" (see item 17 above) is less than 3, write "3" in this space.

CHARGE STATEMENT: Upon the filing of a Declaration pursuant to Rule 60(b) or 60(d), the Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown in the heading hereof for which purpose a duplicate copy of this sheet is attached.

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed.

CUSHMAN DARBY & CUSHMAN, L.L.P.

1100 New York Avenue, N.W.
Ninth Floor, East Tower
Washington, D.C. 20005-3918
Tel: (202) 861-3000

By Atty: Lawrence Harbin Reg. No. 27,644

Sig: _____ Fax: (202) 822-0944
Tel.: (202) 861-3716

Atty/Sec: LH:er

NOTE No. 1: File this Request in duplicate with 2 postcard receipts (CDC-103) & attachments.
NOTE No. 2: Is extension in parent necessary for copendency? **DOUBLE CHECK** Item 11 above.

ASYMMETRIC HYBRID ACCESS SYSTEM AND METHOD

Field of Invention

This invention relates to systems and methods for extending a high-speed network to remote locations using an asymmetric hybrid access system.

Background of the Invention

Current data communication systems typically use symmetric communication paths between transmit and receive sites, which have substantially the same data rates and use the same media in both directions. Such media may include coaxial, fiber optic, or telephone twisted-pair lines. Some networks alternatively use broadcast only paths. However, no current network combines the flexibility of full-duplex symmetric networks with the cost effectiveness of broadcast only networks.

Prior attempts at achieving asymmetric data communications included modems with very low speed return channels or systems combining a low speed broadcast channel with telephone return lines. However, no prior systems were able to extend a symmetric high-speed backbone network to remote locations at high speeds using an asymmetric hybrid access system. Known prior asymmetric systems are limited to low speed links.

It is desirable to develop a network which combines the flexibility of a full-duplex network with the effectiveness of a broadcast network at a reasonable cost.

Summary of the Invention

According to the present invention, a high speed backbone network is extended for communications with remote locations with a hybrid asymmetric architecture having fully interactive duplex characteristics and including independent upstream and downstream communication paths operable at separately selectable speeds and protocols. According to one embodiment of the present invention, the hybrid asymmetric architecture includes 6 Megahertz television channels downstream and telephone lines for upstream communications. Alternative downstream communications can be accomplished according to the invention with a selected high bandwidth broadband service, including for example high definition television (HDTV). Downstream communications according to another embodiment can be implemented with a selected low cost, high speed broadband modem. Downstream communications can provide access to data from information sources including companies, government agencies, universities, libraries, and the like. Alternative upstream communications can be accomplished by a narrow band cable TV return channel, ISDN, radio, or a selected low-cost, low to medium speed telephone modem. The asymmetric hybrid system according to the present invention includes an interface with the backbone network connected to selected information sources. The interface includes point of presence (POP) circuits implementing high speed downstream

communications with lower speed upstream communications. The interface connects the backbone network with cable TV head ends, TV transmitters, cell sites, remote users, and upstream and downstream channels.

The present invention further includes a hybrid access configuration which uses both downstream and upstream channels. The present invention further includes a hybrid access configuration which uses downstream wireless TV channels and upstream public switch telephone network (PSTN), wireless RF communications or integrated services digital network (ISDN) telephone lines. The present invention further includes a hybrid access configuration which uses both downstream and upstream cable TV channels. The present invention further includes a hybrid access configuration which has downstream satellite TV channels and upstream public switch telephone network (PSTN), wireless RF communications, or integrated services digital network (ISDN) telephone lines.

The present invention further includes packet and acknowledge suppression methods to eliminate redundant packet, byte, and acknowledge transmissions in a hybrid access system. A packet is defined as an information unit containing one or more bytes of information. Particularly according to the method of the present invention, a certain amount or number of data packets or bytes are enqueued or transmitted in a transmit-ahead window. Transmission of a window of bytes or packets is followed by a predetermined time-out period while the transmit queue awaits acknowledgments of packets received. To the extent receipt acknowledgments are received as to particular bytes or packets, these packets and bytes in the transmit queue will be deleted from the transmit queue, and the transmit queue is open to receipt of further packets or bytes for

emplacement in slots of the transmission queue for the deletions made. With respect to acknowledgments placed in a transmission queue, indications acknowledging receipt of later bytes and packets supersede acknowledgments of earlier transmitted bytes or packets. Accordingly, under the present invention, the earlier acknowledgments are deleted from an acknowledge transmission queue.

The present invention further includes an automatic address allocation and configuration method in transmissions employing a hybrid access system. According to the present invention, remote users are identified initially with an abstract name, e.g., "Bob," and this abstract name is registered by the network management system. Configuration is established by the downstream routers polling the remote users and registering the location of the remote user responding to the poll made with the particular abstract name. Internet Protocol address and upstream channel allocation is accordingly accomplished subject to the configuration made including abstract name and identified location.

The present invention further includes a prioritized polling method in transmissions employing a hybrid access system. According to a method of the present invention, hybrid upstream routers poll client devices such as remote link adapters (i.e., "RLAs") according to predetermined priority levels. According to one embodiment of the present invention, priority levels are established for state categories of RLAs. According to one embodiment of the present invention, priority level states include status states such as idle, non-responsive, requesting channel(s), active, or active-credit. According to one embodiment of the present invention, RLAs which request a channel are prioritized according to the amount of time its channel requests have gone

unfulfilled. According to one embodiment of the present invention hybrid upstream routers poll downstream RLAs which are idle more frequently than non-responsive RLAs.

The present invention further includes an automatic gain adjustment technique in transmissions employing a hybrid access system, according to which a remote link adapter sends successive indications to a hybrid upstream router at selected different power levels. When a power level indication is received by a hybrid upstream router, the receiving hybrid upstream router confirms receipt of such indication to the sending remote link adapter which then registers an associated power level as qualified. According to one embodiment of the present invention, the selected different power levels are dynamically adjusted in magnitude of transmission level.

The present invention further includes a quality-based upstream channel allocation technique in transmissions employing a hybrid access system. According to the technique, the hybrid upstream router first determines the availability of upstream cable channels by a frequency agile RLA setting a wide range of narrowband upstream channels. The upstream router then makes a quality assessment of available channels in view of most recent demand, and it finally selects an upstream channel in view of the quality assessment made. Quality assessment includes determination of busy status and signal characteristics including error rates, noise floor, and signal to noise ratio. Upstream channels are releasable according to inactivity or time-out criteria, according to which release or reassignment occurs responsive to inactivity for over a threshold period. Inactivity is assessed by the hybrid upstream router monitoring operability indications and data packets received from assigned RLAs.

The present invention further includes a credit allocation technique in transmissions employing a hybrid access system. According to a method of the present invention, an upstream channel is shared by a plurality of RLAs in accordance with a credit criterion, and credit control packets are dispatched to a RLA which permit the RLA to send data packets to arbitrary hosts. Upon sending a data packet, the RLA returns the credit control packet to a server containing software including Hybridware™ code which manages data flows. The Hybridware™ code or Hybridware™ server, according to one embodiment of the present invention, includes software distributed among data processors in the upstream and downstream routers and elsewhere in the HASPOP, including for example in the network management system.

Description of the Drawings

Figure 1 is a detailed schematic drawing of a hybrid access system connected to a backbone network such as the Internet, and having points of presence connecting the backbone network to cable TV headends, TV *transmitters, or Logical Nodes* (e.g., *cell* sites), with remote users connecting to an RLA which in turn connects to downstream TV channels and independent lower speed upstream channels;

Figure 2a is a schematic drawing of a hybrid access system point of presence (POP) according to the present invention including at least a single host computer or server and at least a single router including a hybrid downstream router, a hybrid upstream router, a dial-up router, an Internet router, or a backbone network router, and a POP LAN switch;

Figure 2b is a block diagram of a downstream router according to the present invention;

Figure 2c is a block diagram of an upstream router according to the present invention;

Figures 3a, 3b, and 3c comprise a pictorial diagram of a hybrid access system according to the present invention according to which a remote user can communicate with an information provider through the hybrid access system;

Figure 4 is a logical data flow diagram showing data flows between a server and a client computer of the hybrid access system according to the present invention;

Figure 5 is a flow chart of operation of a two-way cable network embodiment of the hybrid access system according to the present invention;

Figure 6 is a flow chart of operation of a one-way cable network embodiment of the hybrid access system according to the present invention, including provision for upstream telephone system data flow;

Figure 7 is a Hybridware™ server state diagram of the upstream channel allocation method according to the present invention;

Figure 8 is a Hybridware™ client state diagram of the upstream channel allocation method according to the present invention;

Figure 9 is a logical data flow diagram showing data flows between router server and client computers of the hybrid access system for automatic

handling of multiple clients according to automatic address allocation methods of the present invention;

Figure 10 is a flow chart of address allocation control protocol according to the present invention;

Figure 11 is a state diagram of the hybrid adaptive gain control protocol according to the present invention;

Figure 12a is a transmission diagram of information exchange between two nodes in an asymmetric network according to the present invention. having a high downstream data rate of n bits per second and a lower upstream data rate of m bits per second;

Figure 12b is a diagram of conventional downstream messaging of first through fourth data packets, 100, 250. 325, and 450, between first and second nodes, in parallel with upstream transmission of receipt acknowledge indications;

Figure 12c is a diagram of a conventional transmission buffer queue in a RLA of a remote client station;

Figure 12d is a diagram indicating a redundant acknowledgment packet in a conventional transmission buffer queue in a RLA of a remote client station;

Figure 12e is a diagram of a conventional transmission buffer queue, indicating no need for an earlier acknowledgment (ack 100) packet in view of a new acknowledgment (ack 210) packet that supersedes the earlier acknowledgment packet;

Figure 12f is a diagram of first through third network nodes serially connected to each other in accordance with the present invention, wherein the link between the first and second nodes is asymmetric and that between the second and third nodes is symmetric;

Figure 13 is a tabular description of transmission control protocol/ Internet protocol (TCP/IP) data transmission packet protocol header as used in connection with the present invention;

Figure 14a is a diagram of a sequential data transmission between first and second network nodes, according to the present invention;

Figure 14b is a diagram of the contents of a conventional transmission queue in the downstream node during a first time period;

Figure 14c shows the contents of a transmission queue in a downstream node during a later time period, eliminating retransmission of the 300 packet, according to the present invention, because another 300 packet was already in the transmission queue;

Figure 15 is a flow diagram of the acknowledge suppression method according to the present invention;

Figure 16 is a flow diagram of the packet suppression method according to the present invention;

Figure 17 is a flow diagram of information exchanges between Hybridware™ server and client, under conditions in which the client has no information to transmit;

Figure 18 is a flow diagram of information exchanges between Hybridware™ server and client, under conditions in which the client has information to transmit and the server gradually allocates bandwidth to the client;

Figure 19 is a flow diagram of information exchanges between Hybridware™ server and client, under conditions in which the server allocates the client a dedicated channel, the client transmits data and periodically reports to the server with done messages; and

Figure 20 is a flow diagram of information exchanges between Hybridware™ server and client, under conditions in which a dedicated channel is converted into a shared channel.

Description of the Preferred Embodiment

Figure 1 is a detailed schematic drawing of a hybrid access system 1 according to the present invention, showing a RLA and user workstation 29 connected through hybrid access system 1 to a variety of entities connected to a backbone network 20 such as Internet, including information providers 21, corporations 22, government agencies 23, universities 24, and others 25. A backbone network is one which is typically not directly connected to a user. Hybrid access system 1 according to an embodiment of the present invention includes hybrid access system (HAS) points of presence (POPs) 26 and other points of presence 27. HASPOPs 26 include individual HASPOPs 26 (1)-26(3) which enable communication over a broadband network, either by upstream and downstream cable communications or by downstream cable

and upstream telephone communications or various other hybrid configurations (e.g., wireless or satellite). The present invention particularly includes (1) a hybrid access configuration which uses downstream cable TV channels and upstream public switch telephone network (PSTN), wireless RF communications or integrated services digital network (ISDN) telephone lines; (2) a hybrid access configuration which uses downstream wireless TV channels and upstream public switch telephone network (PSTN), wireless RF communications or integrated services digital network (ISDN) telephone lines; (3) a hybrid access configuration which uses both downstream and upstream cable TV channels; (4) a hybrid access configuration which uses both downstream and upstream wireless channels; and (5) a hybrid access configuration with downstream satellite channels and upstream PSTN, wireless RF communications or ISDN telephone channels.

Backbone network 20 such as the Internet which includes a plurality of Internet servers 20 connected to HASPOPs 26 each including a plurality of host computers and/or servers, collectively referred to as hybrid servers. Hybrid access system 1 further includes broadcast units such as, a cable television (TV) head end 28, independent upstream channels 28; and a RLA 29. U.S. Patent No. 5,347,304 (1994) assigned to Hybrid Networks, Inc., and describing an example of an RLA is hereby expressly referenced and incorporated herein in its entirety. An RLA may receive analog broadcast signals including encoded digital information which the RLA decodes and provides to a data terminal or computer. According to an embodiment of the present invention, the downstream flow of information proceeds from HASPOPs 26(1)-26(3) through cable TV head end or TV transmitters 28 or cell sites 30 and through RLA and user workstation 29. Upstream

information flow proceeds in one case from RLA and user workstation 29 through independent upstream channels 28; to HASPOP 26(1), and then to backbone network 20; along T1 or T3 or other digital lines. In another case, upstream information proceeds from user workstation through RLA 29 through the cable TV network, and cable TV head end 28 to hybrid access system point of presence and then through T1, T3, or other digital lines to backbone network 20. The outputs of the cable TV headends or TV transmitters 28 include pluralities of high speed downstream broadband radio frequency, i.e., RF, channels connected to respective remote users 29. Hybrid access system 1 further includes a plurality of cell sites 30 connected through high speed links to a corresponding hybrid access system point of presence 5. The outputs of cell sites 30 include pluralities of high speed downstream broadband channels connected to selected remote users 29. A particular remote user 29 can be connected via an independent lower speed upstream channel to a hybrid access system point of presence 26 as discussed below or via a similar independent lower speed upstream channel to another point of presence system 27. By lower speed it is meant at a speed reduced from the speed of the high speed link used to transmit information downstream. A particular hybrid access system point of presence 5 can be connected via duplex high speed links to a plurality of cable TV headends or TV transmitters, to a plurality of cell sites 30, or a combination of cable TV headends or TV transmitters 28 and cell sites 30.

Figure 2a is a schematic drawing of a point of presence (POP) system 26(1) according to the present invention, including host computers or servers 39 and a POP local area network, i.e., LAN switch 33 to which host computers or servers 39 are connected. Further connected to LAN switch 33

are one or more downstream and one or more upstream hybrid access system point of presence routers, respectively 34 and 35, one or more dial-up routers 36, a network management system 37, and conventional routers 38. Connected to POP LAN switch 33 are one or more data storage elements or systems. Each downstream hybrid access system point of presence router 34 is connected with a high speed link to a TV transmitter or cable TV headend, for example. Further, each upstream hybrid access system point of presence router 35 is connected to a plurality of independent upstream channels, which operate at a lower speed than the downstream high speed links to TV transmitters or cable TV headends. Each dial-up router 36 is connected to a plurality of independent upstream channels operating at a lower speed than the indicated downstream high speed links. Each conventional router 38 is connected along a high speed line to wide area network (WAN) lines to selected information providers, Internet, or other nodes or businesses. POP LAN switch 33, according to one embodiment of the present invention is connected directly along a high speed line to wide area network (WAN) lines to selected information providers, Internet, or other nodes or businesses.

Figure 2b is a block diagram of hybrid downstream router 34 according to the present invention. In particular, downstream router 34 includes network interface 34a, link interface 34b, physical interface 34c, controller 34d, physical interface 34e, link interface 34f, and network interface 34g. Downstream router 34 and physical interface 34e are connected to POP LAN switch 33 for sending and receiving information, and physical interface 34e, link interface 34f, and network interface 34g are serially connected to each other and to controller 34d for bidirectional communication of selected information. Additionally, controller 34d is connected directly to each of

physical interface 34e and link interface 34f along indicated lines to accomplish control and messaging functions. Downstream router 34 and physical interface 34c are connected to cable TV headends, TV broadcast sites, cell cites or the like, to communicate information primarily or exclusively in a unidirectional or downstream direction, and physical interface 34c, link interface 34b, and network interface 34a are serially connected to each other and to controller 34d for selected communication of selected information. Additionally, controller 34d is connected directly to each of physical interface 34c and link interface 34b along indicated lines to accomplish control and messaging functions. Downstream router 34 may include one or more of physical interfaces 34c. According to an embodiment of the present invention, router 34 may be a bridge without network interfaces 34a and 34g or a connection without network interfaces 34a and 34g and without link interfaces 34b and 34f. According to yet another embodiment of the present invention, router 34 can be a gateway.

Figure 2c is a block diagram of upstream router 35 according to the present invention. In particular, upstream router 35 includes network interface 35a, link interface 35b, physical interface 35c, controller 35d, physical interface 35e, link interface 35f, and network interface 35g. Upstream router 35 and physical interface 35e are connected to POP LAN switch 33 for sending and receiving information, and physical interface 35e, link interface 35f, and network interface 35g are serially connected to each other and to controller 35d for bidirectional communication of selected information. Additionally, controller 35d is connected directly to each of physical interface 35e and link interface 35f along indicated lines to accomplish control and messaging functions. Upstream router 35 and

physical interface 35c are connected to upstream channels, e.g., telephone links for example, to communicate information primarily or exclusively in a unidirectional or upstream direction, and physical interface 35c, link interface 35b, and network interface 35a are serially connected to each other and to controller 35d for selected communication of selected information. Additionally, controller 35d is connected directly to each of physical interface 35c and link interface 35b along indicated lines to accomplish control and messaging functions. Upstream router 35 may include one or more of physical interfaces 35c. According to an embodiment of the present invention, router 35 may be a bridge without network interfaces 35a and 35g or a connection without network interfaces 35a and 35g and without link interfaces 35b and 35f. According to yet another embodiment of the present invention, router 35 can be a gateway.

Figure 3a-3b are drawings of a hybrid access system 1 according to the present invention according to which remote user having a workstation 2 or connected to LAN 61, as shown respectively in Figures 3b and 3c can communicate with a selected information provider 21 including LAN 50, bridge or router 51 connected to LAN 50, and dial-up router 52 connected to LAN 50 through a hybrid access system point of presence 5. Further, HAS POP is connected along a high speed link to bridge or router 51. Additionally, HAS POP 5 is linked to other information providers to receive selected information items. Additionally, dial-up router 52 is connected to a plurality of upstream channels. Figure 3b and 3c additionally show respective first and second users, in one case including workstation 2 in turn including a RLA 60 and in the other instance including RLA 60 and a local area network (LAN) 61 connected to RLA 60. First user 29(1) is connected

to an upstream channel from user workstation 2, and second user 29(2) is connected to an upstream channel directly from RLA 60. In the case of each user, RLA 60 receives input information, particularly radio frequency (RF) information along one of respective input channels connected thereto.

Figure 4 is a logical data flow diagram showing data flows between a server and a client computer of the hybrid access system 1 according to the present invention. Hybrid access system 1 includes a server application 70, a hybrid system manager 71, and a Hybridware™ server 72 connected to LAN 38. Hybrid access system 1 further includes a Hybridware™ client 73 and a client application 74 operating with Hybridware™ client 73. Hybridware™ client 73 communicates with Hybridware™ server 72, as transmitter along upstream channel 75 or as receiver along downstream channel 76. Downstream data traffic is expected to be higher capacity than upstream data traffic: Hence, the bolder depiction of downstream channel 76 than upstream channel 75.

Figure 5 is a flow chart of operation of a two-way cable network embodiment of hybrid access system 1 according to a hybrid protocol embodiment of the present invention. In particular, according to one embodiment of the hybrid protocol of the present invention, client application 74 sends 100 data to server application 70 in an upstream direction, thereby issuing a connection request. Hybridware™ client 73 buffers the data received and checks if it controls an upstream data channel. If it does, then the data is transmitted forthwith. If it doesn't, Hybridware™ client 73 queues up the data message and creates 101 a channel request for a particular subchannel within upstream channel 75. Hybridware™ client 73 then waits 102 for a poll from Hybridware™ server 72, i.e., Hybridware™

router. According to an embodiment of the present invention, prioritized polling is conducted whereby not all clients are polled at the same frequency. Clients in an idle state are polled relatively frequently. Clients in blocked and NON-RESP states are polled but not at the same relatively high frequency. Clients in an ACTIVE state are not polled at all. This is based on the assumption that an active client has what it wants and that it is most important to respond quickly to new connections coming from clients in an IDLE state. Those clients coming from a NON_RESP cycle receive second order attention and can wait a little longer, since they may have already been in a state where communication are impossible and may have been in that state for a considerable period of time. According to one embodiment of the present invention, a poll cycle is the smallest period such that all but active clients are polled at least once. Idle clients may be polled multiple times during one poll cycle. Blocked and non_resp clients are distributed evenly across the poll cycle to assure that the latency for acquiring a channel for idle units is uniform. All clients are grouped according to their state and polled within each group according to the round robin approach according which each of a series is polled in sequence and then the same sequence is repeatedly polled individual by individual. Upon receipt of a poll, Hybridware™ client 73 sends 103 a channel request via lower speed upstream channel 75. Hybridware™ router 72, i.e., server, receives 104 the channel request from Hybridware™ client 73 and initially sends 105 a login message to Hybridware™ system manager 71. Hybridware™ system manager 71 verifies 106 that Hybridware™ client 73 is an authorized user of data processing services on the particular node or system within which hybrid access system 1 operates. Then, Hybridware™ router 72 receives 107 a login response message from Hybridware™ system manager 71 through

LAN 38, which indicates whether the client is allowed to operate on the particular network and which contains other operating characteristics of Hybridware™ client 73. Hybridware™ router 72 then allocates 108 (see state diagrams of Figures 7 and 8) an upstream channel 75 for Hybridware™ client 73, depending on channel availability and suitability. Suitability depends on factors including but not limited to channel quality, type of service required, operating characteristics of Hybridware™ client 73, configuration restrictions, and the like. Hybridware™ router 72 sends 109 an upstream channel allocation message to Hybridware™ client 73 via high speed downstream channel 76, which may according to one embodiment of the present invention specify the frequency on which Hybridware™ client 73 is permitted to transmit. Thereafter, Hybridware™ client 73 receives 110 an upstream channel allocation. Next, Hybridware™ client 73 tunes 111 to the specifically allocated upstream data channel frequency on which it is permitted to transmit data. Finally, Hybridware™ client 73 sends 112 the selected application data from client application 74. Accordingly, client application 74 and server application 70 are able to send and receive 113 data via upstream bandwidth management of an asymmetric hybrid access system, according to the present invention.

Figure 6 is a flow chart of operation of a one-way cable network embodiment of the hybrid access system 1 according to the present invention, including provision for upstream telephone system data flow. According to this embodiment of the present invention, when client application 74 needs to communicate with server application 70 in an upstream direction, Hybridware™ client 73 dials 202 Hybridware™ router 72. Then, Hybridware™ client 73 sends 203 a channel request via lower speed PSTN

upstream channel (not shown). Hybridware™ router 72 receives 204 the channel request and sends 205 a login message to Hybridware™ system manager 71. Hybridware™ system manager 71 verifies 206 Hybridware™ client 73 as an authorized user. Then, Hybridware™ router 72 receives 207 a login response from Hybridware™ system manager 71. Hybridware™ router 72 sends 208 an authorization message to Hybridware™ client 73 via high speed downstream channel 76. Hybridware™ client 73 receives 209 the authorization message for use of a selected upstream PSTN channel. Finally, Hybridware™ client 73 sends 212 the selected application data. Accordingly, client application 74 and server application 70 are able to send and receive 213 selected data via the asymmetric hybrid access system 1.

Figure 7 is a Hybridware™ server state diagram for upstream channel allocation of the hybrid access system according to one embodiment of the present invention. According to the state diagram of Figure 7, the Hybridware™ server can be in one of four states: IDLE 301, NON_RESP 304, BLOCKED 302, or ACTIVE 303. In the IDLE state, the Hybridware™ server expects an IDLE poll response. If there is no request to the client from the application or a channel request message, or if there is application data that needs to be sent in the upstream direction. Upon receiving a channel request message, the server transitions the client to a BLOCKED state. In a BLOCKED state, the server sends one of two messages to the client, a channel allocation message or a no channel available message. Upon sending a channel allocation message, the server transitions the client to an ACTIVE state. Upon sending a no channel available message, the client remains in a BLOCKED state. The client will remain in the BLOCKED state until either a channel becomes available in which case the server will transition the client

to the ACTIVE state or the server receives a channel release message in which case the server will transition the client to the IDLE state. In the ACTIVE state, the server does not poll the client. The server transitions the client from ACTIVE to IDLE upon receiving a channel deallocation message or upon detecting a system defined inactivity time-out. In the ACTIVE state, the server waits for a periodic heartbeat message from the client. The Hybridware™ server software awaits periodic heartbeat messages from the client at selected time intervals. The server software monitors other channel quality parameters including errors and signal to noise ratios. If the server stops hearing a certain number of operability indications or signals within a system defined interval as to a particular client, or if particular parameters (e.g., signal to noise ratio), then the server send a directed poll to the particular client. Essentially, the client is instructed to respond on another control frequency. If the client responds on the designated control frequency, the server reassigns the upstream channel to the client, so that it can continue to operate. If not, the client is deemed NON_RESP. Channel quality monitoring and channel reassignments are done transparently to the user and the applications. If a certain, system defined, consecutive count of heartbeat messages is missed, the server issues a special poll message or directed poll. If the client does not respond, the server transitions to the NON_RESP state. If the client responds to the poll, the server either remains in the ACTIVE state or transitions to the IDLE state. The former happens, if the client responds with a channel request message, and the latter happens, if the client responds with an IDLE poll response. In the former case, the server may decide to assign a different upstream channel to the client. In the BLOCKED or IDLE state, the server will transition the client to NON_RESP. i.e., "non-responsive," state after the client fails to respond to a system defined number

of polls. The NON_RESP state is almost identical in terms of state transition to idle state, a difference being that an IDLE poll response transitions the client into an IDLE state.

Figure 8 is a Hybridware™ client state diagram for upstream channel allocation of the hybrid access system 1 according to an embodiment of the present invention, involving two way cable communication. According to this embodiment, the hybrid upstream client protocol has three states, IDLE 401, CON_REQ, i.e., "connect request" 402, and ACTIVE 404. In the IDLE state, the client, when polled, will transmit an IDLE poll response, if there is no request from the application. However, it will respond with a channel request message, if there is data that needs to be sent upstream. Upon transmitting a channel request message, the client transitions to a CON_REQ state. In the CON_REQ state, the client expects one of two messages from the hybrid router, a channel allocation or a no-channel allocation signal. Upon receiving a channel allocation message, the client informs the application and tunes to the channel it was allocated and transitions to the ACTIVE state. Upon receiving a no-channel available message, the client informs the application and transitions to the IDLE state. In the ACTIVE state, the client forwards data messages from the application to the upstream transmitter. In the ACTIVE state, the client further monitors the application activity and if it detects that no data has moved from the application to the upstream transmitter for a system defined period of time, it will send a channel deallocation request and transition to an idle state. In an ACTIVE state, the application may explicitly request that the channel be released, in which case the client will send a channel deallocation request to the hybrid router and will transition to the IDLE state. In the ACTIVE state, the client

periodically sends an operability indication message to the server. If the client receives a poll message during the ACTIVE state, it will send a channel request message and will transition to a CON_REQ state. The hybrid router may also send an unsolicited channel release message, in which case the client will notify the application and transition from ACTIVE state to IDLE state.

Figure 9 is a logical data flow diagram showing data flows between server and client computers of the hybrid access system 1 according to the present invention, for multiple clients under an address allocation protocol simplifying distribution of ip addresses to remote systems. The protocol according to the present invention determines where a given Hybridware™ client is located and how to download its ip address, given that the client has no address yet. Hybrid access system 1 includes a server application 70, a hybrid system manager 71, and Hybridware™ servers 72a & 72b connected to LAN 38. Hybrid access system 1 further includes Hybridware™ clients 73a and 73b and client applications 74a and 74b operating with respective ones of Hybridware™ clients 73a and 73b. Hybridware™ client 73a communicates with Hybridware™ server 72a, as transmitter along upstream channel 75a or as receiver along downstream channel 76a. Hybridware™ client 73b communicates with Hybridware™ server 72b, as transmitter along upstream channel 75b or as receiver along downstream channel 76b. Downstream data traffic is expected to be higher capacity than upstream data traffic: Hence, the bolder depiction of downstream channels 76a and 76b than upstream channels 75a and 75b.

Figure 10 is a flow chart of address allocation control according to an embodiment of the present invention to logon and configure Hybridware™

clients with a selected unique node name which is entered in the configuration database in the hybrid system manager 71 which is the software portion of network management system 37. In particular, hybrid system manager 71 sends 500 a new client message to all hybrid routers 72a and 72b after learning of particular new clients by message, mail, or telephone call. At this point the hybrid system manager is aware of a Hybridware™ client identification name and equipment serial number, but has not associated the client identification name with a separate unique client address (e.g., Internet Protocol, or IP address) provided by separate automatic registration. Each hybrid router 72a and 72b periodically broadcasts 501 a configuration poll message. Hybridware™ clients recognize 502 their preselected unique names during a configuration poll. Hybridware™ clients 72a and 72b respond to the configuration poll. Hybrid routers 72a and 72b receive respective configuration poll responses. Then, hybrid routers 72a and 72b send respective client found messages to system manager 71. System manager 71 then sends a cease configuration poll message to all hybrid routers. Further, system manager 71 allocates an Internet protocol (IP) address and other configuration data for each new client according to the preselected unique names. System manager 71 sends the IP address and other configuration data to the applicable hybrid router 72a, 72b. Then, the applicable hybrid router 72a, 72b sends using broadcast or unicast and the unique name the corresponding IP address and other configuration data to the applicable Hybridware™ client. As a result, the Hybridware™ client receives the IP address and other configuration data determined and reconfigures appropriately. In summary, according to the present invention, an automatic address allocation and configuration method in transmissions employs a hybrid access system. Remote users are identified initially with a

unique abstract name, e.g., "Bob," and this abstract name is registered by the network management system. Configuration is established by the upstream routers polling the remote users and registering the location of the remote user responding to the poll made with the particular abstract name. Upstream channel allocation is accordingly made subject to the configuration made including abstract name and identified location. Automatic address allocation and configuration is accordingly accomplished on line at an initial log-on session with a new user. The method of the present invention is accordingly swift and simple, eliminating registration relays experienced by many known log-in systems.

Figure 11 is a state diagram of the hybrid adaptive gain control protocol according to the present invention, which overcomes noise and attenuation while transmitting on cable in an upstream direction. The hybrid adaptive gain control protocol has a searching state 600 and a stable state 601. In stable state 601, the protocol evaluates poll messages from the hybrid router. If a poll message indicates loss of a poll response, the protocol transitions to the searching state 600. Poll responses are transmitted at a fixed power level. In the searching state 600, the client system responds to polls with a poll response at larger and larger power levels. After receiving a system specified, number of consecutive polls with an indication of a successful poll response, the system transitions to a stable state.

Figure 12a is a transmission diagram of information exchange between nodes A and B. Nodes A and B comprise an asymmetric network according to the present invention, having a high downstream data rate of n bits per second and a lower upstream data rate of m bits per second. The downstream data rate n is greater than the upstream data rate m. Node B includes receive

and transmission queues to hold information received and to be sent, including acknowledge indications or messages. The acknowledge suppression method according to the present invention relates to the node or system transmitting data acknowledgments, which acknowledges receipt of either data packets or data bytes contained in incoming packets. The numbers on data packets indicate the position of the last data byte of the packet in the data stream, and the acknowledgment numbers indicate that all the bytes of the data stream up to and including the byte indicated have been received. According to the method of the present invention, the acknowledgment of byte k (or packet number k) indicates that all bytes or packets prior to k have been received. According to a method of the present invention, the transmit queue queues up additional acknowledgment packets as new packets are received. Figure 12b is a diagram of messaging of first through fourth data packets, 100, 250, 325, and 450, between upstream and downstream nodes, in parallel with upstream transmission of receipt acknowledge indications with respect to only two data packets, namely 250 and 450. Figure 12c is a diagram indicating acknowledgment of first and second packet receptions during a first time period. In particular, packet 1 (i.e., "pkt 1") is currently being sent, and an acknowledge (i.e., "ack 250") message is currently being appended at the end of the transmit queue. Figure 12d is a diagram indicating acknowledgment of another packet during another period. Figure 12e is a diagram indicating no need for an acknowledge 100 signal in view of a prior acknowledgment having been successful. In particular, according to the acknowledge suppression method of the present invention, not all acknowledgment packets will be sent to node A, because the "ack 210" message carries information which supersedes the "ack 100" message. Accordingly, the amount of traffic on the

communication link from B to A is reduced, according to the present invention. In general, this introduces an acknowledge latency , but where all messages queued up for transmission are acknowledgments, acknowledgment latency is reduced. For example, when an "ack 15" signal is transmitted and an "ack 100" message awaits transmission, and an "ack 210" message is appended to the queue, the acknowledge suppression method according to the present invention will delete the "ack 100" message as superfluous. Any new acknowledgments appended while "ack 15" is being transmitted will result in deletions of unnecessary acknowledgments keeping queue length to two. Upon transmit completion of "ack 15," the next acknowledgment, e.g., "ack 210" will be transmitted. Accordingly, the method of the present invention eliminates unnecessary transmission of "ack 100" signals and provides for reduced acknowledgment latency for "ack 210." The ack suppression method according to the present invention, accordingly reduces the probability of queue overflow and potential out of memory conditions in system B. It reduces the load on the communication link from B to A, and in some circumstances reduces acknowledgment latency for data transfers from B to A. Figure 12f is a diagram of first through fourth network nodes serially connected to each other in accordance with the present invention, wherein the link between the first and second nodes is symmetric, the link between the second and third nodes is asymmetric and that between the third and fourth nodes is symmetric. The acknowledge suppression method of the present invention applies to both the communications system of Figure 12a, in which nodes A and B are end nodes, as well as to the communications system of Figure 12f, in which nodes B and C are intermediate systems such as a router, and data packets

originating at node D are transmitted through router nodes C and B to a central system connected to node A.

Figure 13 is a tabular description of a transmission control protocol/ Internet protocol (TCP/IP) data transmission packet protocol header as used in connection with the present invention. The first five 32 bit words and the following IP options are referred to as the IP header. The five words following the IP options together with the words containing TCP options are referred to as the TCP header. The non-ack TCP header is the TCP header less the acknowledgment number field.

Figure 14a shows sequential data transmission between first and second nodes, according to the present invention. As shown in Figure 14a, data packets or bytes 100-700 are transmitted from node A to node B. Concomitantly, acknowledge messages, "ack 100," "ack 200," and "ack 300," were dispatched from node B to node A.

Figure 14b shows a data packet sequence of packets 100-400 held in the transmit queue during a first time period, followed by a single acknowledgment, "ack 100."

Figure 14c is a diagram of a data packet sequence transmitted during a later time period, eliminating retransmission of the 300 packet, because another 300 packet was already in the transmission buffer.

Figure 15 is a flow diagram of an acknowledge suppression (AS) method, i.e., an AS method, according to the present invention in which receipt of information transmitted from system A to system B over a first independent simplex communication link is acknowledged by system B. The

method of the present invention starts 1500 at a particular time, and a first packet Mi of information is received 1501. If the transmit queue is not empty 1502, the header of the last packet Mi+1 on the transmit queue is obtained 1503. If the transmit queue is empty 1502, then Mi is enqueued 1509 and the AS method according to the present invention is completed. If the header of the last packet Mi+1 on the transmit queue equals 1504 the header of packet Mi, and the NON-ACK TCP header of Mi equals 1505 the NON-ACK TCP header of Mi, then Mi+1 is discarded 1506. If the header of the last packet Mi+1 on the transmit queue does not equal 1504 the header of packet Mi, or the NON-ACK TCP header of Mi does not equal 1505 the NON-ACK TCP header of Mi, then Mi is enqueued 1509 and the AS method according to the present invention is completed. If Mi+1 is not the last message on the queue 1507, then the header on the next packet Mi+1 on the transmit queue is obtained 1508, and a comparison is done to determine whether the header of the last packet Mi+1 on the transmit queue equals 1504 the header of packet Mi. If Mi+1 is the last message on the queue 1507, then Mi is enqueued 1509 and the AS method according to the present invention is completed.

Figure 16 is a flow diagram of the packet suppression (PS) method according to the present invention. The method of the present invention starts 1600 at a particular time, and a first packet Mi of information is received 1601. If the transmit queue is not empty 1602, the header of the last packet Mi+1 on the transmit queue is obtained 1603. If the transmit queue is empty 1602, then Mi is enqueued 1609 and the PS method according to the present invention is completed. If the header of the last packet Mi+1 on the transmit queue equals 1604 the header of packet Mi, then Mi+1 is discarded 1606. If the header of the last packet Mi+1 on the transmit queue does not

equal 1604 the header of packet Mi, then Mi is enqueued 1609 and the PS method according to the present invention is completed. If Mi+1 is not the last message on the queue 1607, then the header on the next packet Mi+1 on the transmit queue is obtained 1608, and a comparison is done to determine whether the header of the last packet Mi+1 on the transmit queue equals 1604 the header of packet Mi. If Mi+1 is the last message on the queue 1607, then Mi is enqueued 1609 and the PS method according to the present invention is completed.

Figure 17 is a flow diagram of information exchanges between Hybridware™ server and client, according to conditions in which the client has no data to transmit. A credit (1, F) corresponding to a predetermined amount of data, e.g., ten bytes, or ten packets, is transmitted from node A to node B, and a done signal DONE(0,0) is transmitted from node B to node A, *indicating that no data packet was transmitted, leaving the existing credit* level of the particular channel unchanged. The credit protocol according to the present invention permits single upstream cable channels to be shared by multiple remote link adapters. Alternatively, a single upstream channel is controlled and used by a single remote link adapter until the channel is relinquished. The present invention includes an allocation method in transmissions employing a hybrid access system. According to a method of the present invention, an upstream channel is shared by a plurality of remote link adapters in accordance with a credit criterion, and credit control packets are dispatched to a remote link adapter which permit the remote link adapter to send data packets to arbitrary hosts. Upon sending a data packet, the remote link adapter returns the credit control packet to a Hybridware™ server. A credit permits a remote link adapter to send a certain number of

packets up to a maximum number controlled by a configuration parameter MAX_ CREDIT_ PACKETS, thereby eliminating polling for that period. If a remote link adapter does not have a data packet to send, it returns the credit to the hybrid access system without sending any data packets. The remote link adapter then sets a field in the credit control packet to the number of packets which was sent. If the protocol process at the server does not receive credit status information from the credit control packet within a certain credit time-out, CREDIT_TIMEOUT, in milliseconds, for a certain number of times, FAIL_CNT, consecutively, the remote link adapter is assumed to be in error and is put in a not-responding state. The overall upstream channel performance of a remote link adapter using a credit channel is lower than a remote link adapter on a sole use upstream channel. If any sole use upstream channel becomes available, this channel is given to the credit remote link adapter that has been waiting the longest for a sole use upstream channel that currently has packets to send.

Figure 18 is a flow diagram of information exchanges between Hybridware™ server and client, according to conditions in which the client has information to transmit and the server gradually allocates bandwidth to the client. In particular, a node first provides a single credit at a selected frequency. Then a packet is sent, consuming the credit, followed by a completion message indicating use of one credit and potential for an additional transmission corresponding to three credits. Next, a credit is provided corresponding to two packets at the selected frequency, which is followed by two packet transmissions and a completion message indicating consumption of two credits and potential for transmission of one more. In response, another double credit is sent, followed by a single packet and an

acknowledgment of transmission of one and potential for no more transmissions.

Figure 19 is a flow diagram of information exchanges between Hybridware™ server and client, according to conditions in which the server allocates the client a dedicated channel, the client transmits data and periodically reports to the server with done messages. In particular, a credit indication dedicating a channel at frequency F is provided, followed by 235 packet transmissions. According to prearrangement, a operability indication in the form of a DONE message is provided at an established time indicating potential for five more packet transmissions. The done message indicates completion of 235 packet transmissions, as an accounting function. Because the channel is dedicated, further packet transmissions are made without specific further credit allocations.

Figure 20 is a flow diagram of information exchanges between Hybridware™ server and client, according to conditions in which a dedicated channel is converted into a shared channel. In particular, a credit indication is provided, followed by transmission of 235 packets and a credit message stopping channel dedication and switching to a credit mode. Responsive to the credit message a DONE signal accounts for the 235 packets transmitted during the dedicated mode and indicates potential for five more transmissions. This is followed by a credit allocation of one at a selected frequency. Thus, one packet is transmitted, followed by a completion indication specifying potential for four more packets to be transmitted.

What is claimed is:

1. A hybrid access system for connecting at least a single client data processor with a network, comprising:

a local area network (LAN) system;

a hybrid system manager connected to said LAN system;

a downstream router connected to said LAN system for transmitting information;

an upstream router connected to said LAN system for receiving information, said upstream bridge router including a Hybridware™ server.

a broadcast unit connected to said downstream router;

a downstream channel connected to said broadcast unit for high speed transmission of information on said high speed downstream channel;

an independent upstream channel connected to said upstream router, which operates at a lower speed than said downstream channel;

at least a single remote link adapter connected to said upstream and downstream channels; and

a corresponding at least a single client data processor connected to said remote link adapter.

2. The hybrid access system according to claim 1, wherein said independent upstream channel includes a telephone network.

3. The hybrid access system according to claim 1, wherein said independent upstream channel includes a cable TV network.

4. The hybrid access system according to claim 1, wherein said independent upstream channel includes a wireless transmission path.

5. The hybrid access system according to claim 1, wherein said LAN system includes a LAN switch and a router.

6. The hybrid access system according to claim 1, wherein said broadcast unit includes at least one of a group consisting of a cable TV headend, a wireless TV transmitter, a satellite transmitter or a cell site.

7. A method of accessing a wide area network from any of a plurality of client processors each connected to an asymmetric hybrid network including high-speed downstream and lower-speed upstream channels controlled by a hybrid system manager and a router server, including the steps of:

providing a polling signal from a hybrid system manager to client processors.

issuing an upstream channel connection request by lower speed channel, if no upstream data channel is currently assigned to a client data processor.

conducting login communications between the router server and the system manager.

verifying authorized user status at the system manager level.

allocating an upstream channel by high speed downstream channel message, and

sending upstream data over the allocated lower speed upstream channel of the asymmetric hybrid access network.

8. The method according to claim 7, wherein providing a polling signal includes polling clients in an idle state at a selected frequency level of polling.

9. The method according to claim 7, wherein providing a polling signal includes polling clients in a blocked state at a selected frequency level of polling.

10. The method according to claim 7, wherein providing a polling signal includes polling clients in a non-responsive state at a selected frequency level of polling.

11. The method according to claim 7, wherein providing a polling signal includes polling clients in idle and blocked states at selected first and

second frequency levels of polling, and polling of clients in an idle state occurs more frequently than polling of clients in a blocked state.

12. The method according to claim 7. wherein providing a polling signal includes polling clients in idle and non-responsive states at selected first and second frequency levels of polling, and polling of clients in an idle state occurs more frequently than polling of clients in a non-responsive state.

13. The method according to claim 7. wherein idle clients are polled multiple times during a poll cycle and polling of blocked and non_resp clients is distributed evenly over a poll cycle to assure that the latency for acquiring a channel for idle units is uniform.

14. The method according to claim 7. wherein polling includes grouping clients by state and polling within each group *round robin.*

15. A method of high speed remote access of a wide area network from any of a plurality of client processors each connected to an asymmetric hybrid network including high-speed downstream and lower-speed upstream channels controlled by a hybrid system manager and a router server. including the steps of:

issuing an upstream channel authorization request by lower speed channel. for upstream data channel currently used by a particular client data processor.

conducting login communications between the router server and the system manager.

verifying authorized user status at the system manager level.

authorizing specific upstream channel use by high speed downstream channel message, and

sending upstream data over the allocated lower speed upstream channel of the asymmetric hybrid access network.

16. A method of high speed remote access of a wide area network from any of a plurality of client processors each connected to an asymmetric hybrid network including high-speed downstream and lower-speed upstream channels controlled by a hybrid system manager and a router server. including the steps of:

sending a new client message to a plurality of hybrid routers. which provides client names.

broadcasting a poll message to a plurality of clients using client names.

recognizing a client name.

providing a poll response.

receiving a poll response.

reporting a client found to a system manager.

ceasing polling.

providing an address to the client which responded to poll.

receiving the address sent. and

configuring the client with the address provided.

17. A method of transmitting data from an upstream transmit queue in an upstream transmitter node to a selected receiver node, comprising the steps of:

transmitting selected amounts of data from a transmit queue in a first node to a second node.

generating acknowledgments of data received by said second node.

eliminating from the transmit queue of the second node data acknowledgments which are redundant of other acknowledgments in said second transmit queue, and

filling open transmit queue spaces with additional data.

18. A method of determining polling frequency from an upstream communications mode of a hybrid access system with respect to a plurality of downstream nodes having polling status levels corresponding to activity states in which a remote link adapter may be set, comprising the steps of:

determining the priority status of predetermined remote link adapters in a hybrid access system; and

polling the remote link adapter having the highest priority status level.

19. A method of setting remote link adapter power level in a hybrid access system, comprising the steps of:

transmitting successive indications to a hybrid upstream router at selected different power levels.

confirming receipt of a first power level indication. and

setting the level of future transmissions to a power associated with confirmation of receipt.

20. A method of packet suppression in communication between first and second nodes having respective first and second transmit and receive queues. in which information packets having headers are transmitted from said first node to said second node. comprising the steps of:

loading the transmit queue of said first node with a first information packet;

loading a second information packet into the transmit queue of said first node;

checking the headers of said first and second information packets. and

suppressing one of said first and second information packets. if the headers are the same.

21. A method of credit administration between first and second computer nodes. for information amounts having predetermined information credit values. comprising the steps of:

sending a credit to a first computer node. which sets a response frequency;

receiving an information amount corresponding in value up to the amount of the credit received at said first computer node at said response frequency; and

sending a done signal to said second computer node indicative of the credit received less the amount of information received.

22. A method of operating a client node. comprising the steps of:

sending periodic operability indication messages during an active state.

receiving a poll message. and requesting channel connection.

23. A method of operating a server node. comprising the steps of:

receiving periodic operability indication messages during an active state.

sending a polling message. when a threshold interval has expired.

awaiting a poll response. and

entering a non-responsive state if response to polling is received.

24. A method of responding to detected quality levels in a communication channel, comprising the steps of:

detecting a quality characteristic with respect to a selected communication channel from a selected group of quality characteristics each which is defined by quantitative levels.

determining whether the quantitative level of the detected quality characteristic deviates with respect to a predefined norm, and

switching to another communication channel, if sufficient deviation is determined.

25. The method according to claim 24, wherein said group of quality characteristics includes time from last operability indication, signal to noise ratio, and error frequency.

Abstract of the Disclosure

A hybrid access system and method using a hybrid access system point of presence router and a remote link adapter to connect a user computer terminal to a network for fast downstream information transfer by high speed information broadcasting with lower speed upstream information transfer through an independent upstream channel to the hybrid access system point of presence router. High speed downstream information transfer passes through a cable TV headend or a TV transmitter or a cell station.

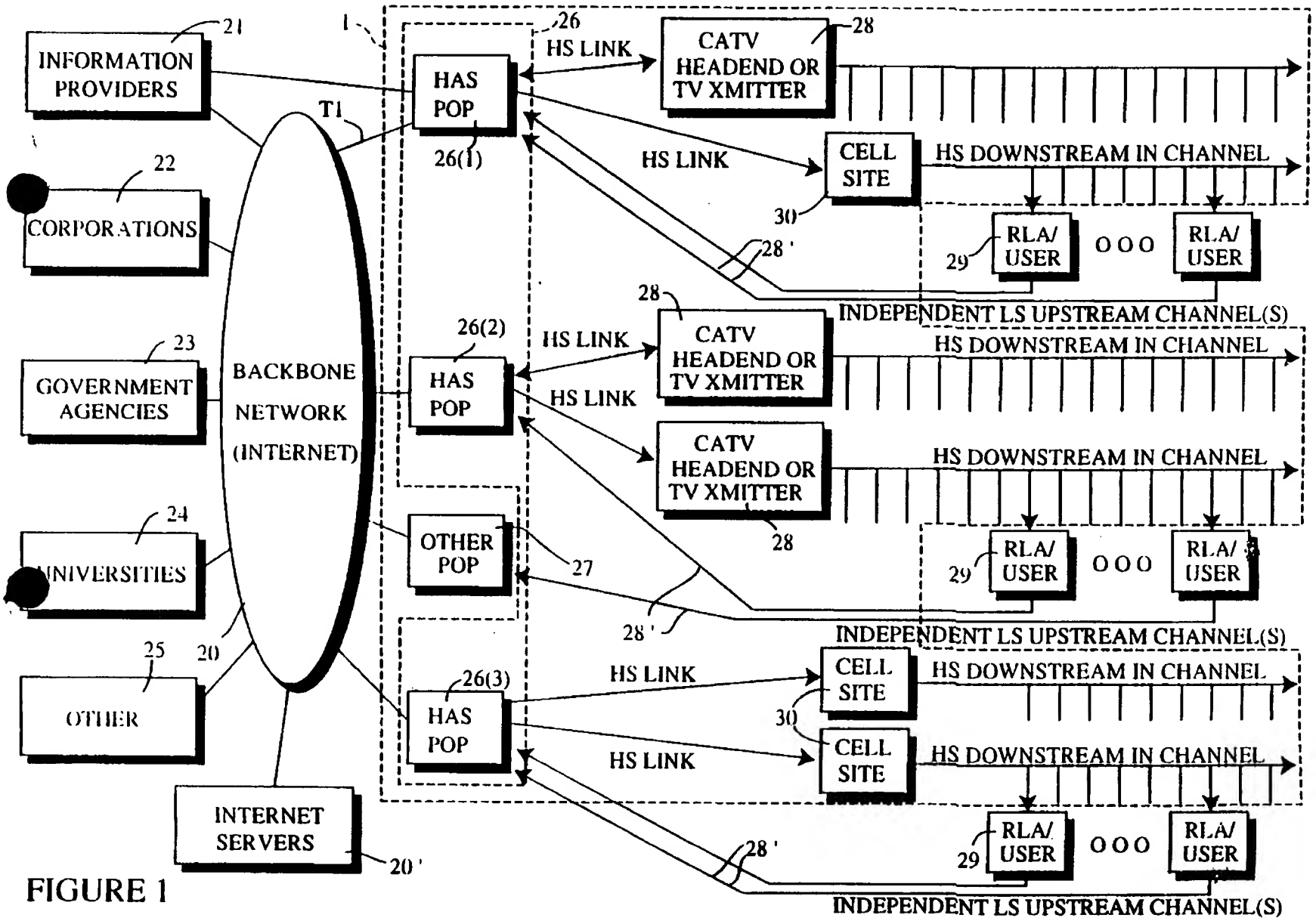
INFORMATION PROVIDERS
21
CORPORATIONS
22
GOVERNMENT AGENCIES
23
UNIVERSITIES
24
OTHER
25
20
INTERNET SERVERS
20'
BACKBONE NETWORK (INTERNET)
T1
1
HAS POP
26(1)
HAS POP
26(2)
OTHER POP
27
HAS POP
26(3)
26
HS LINK
CATV HEADEND OR TV XMITTER
28
CELL SITE
30
HS DOWNSTREAM IN CHANNEL
RLA/ USER
29
OOO
28'
INDEPENDENT LS UPSTREAM CHANNEL(S)

FIGURE 1

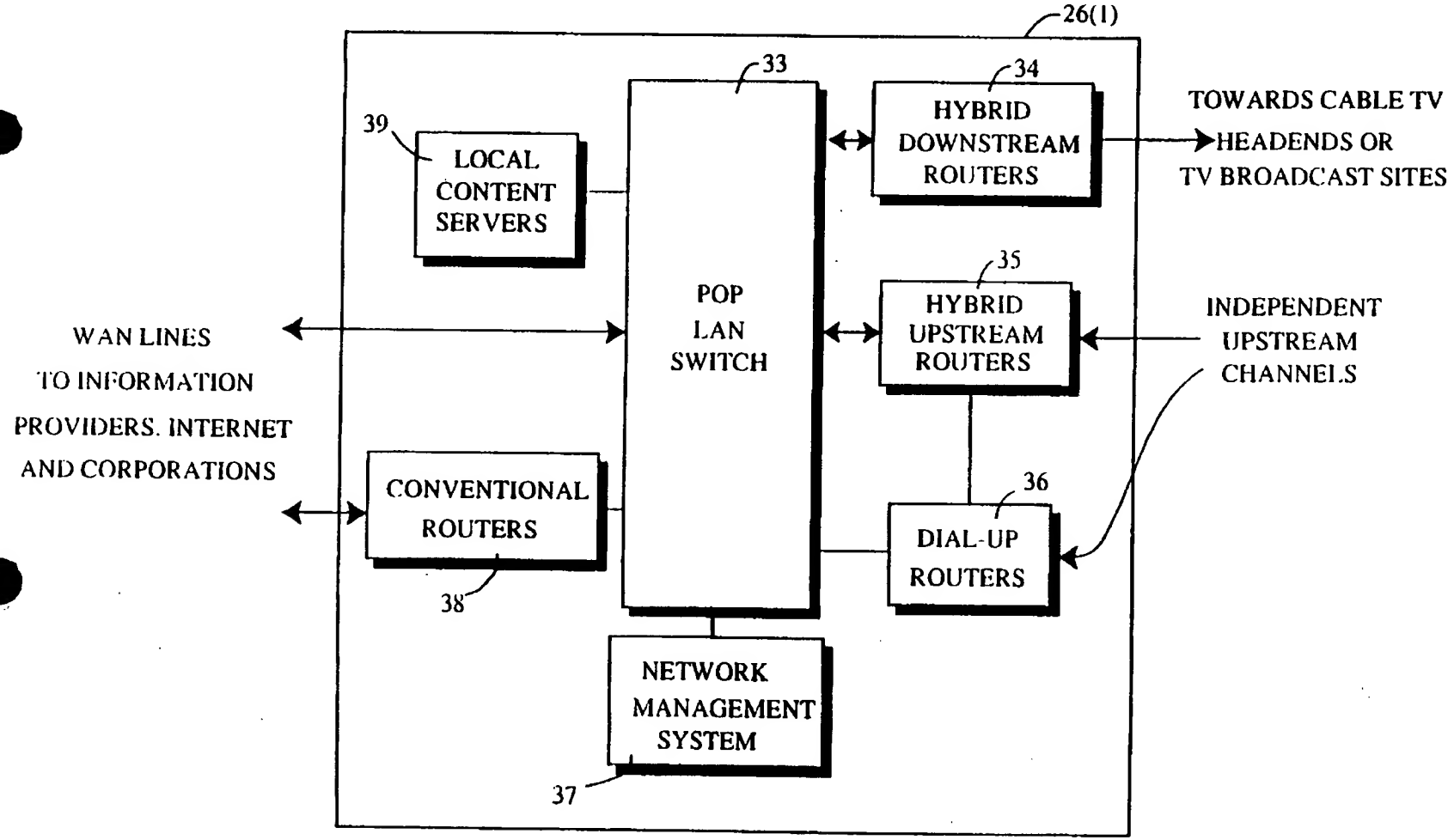
26(1)
33
34
39
LOCAL CONTENT SERVERS
HYBRID DOWNSTREAM ROUTERS
TOWARDS CABLE TV HEADENDS OR TV BROADCAST SITES
35
POP LAN SWITCH
HYBRID UPSTREAM ROUTERS
INDEPENDENT UPSTREAM CHANNELS
WAN LINES TO INFORMATION PROVIDERS, INTERNET AND CORPORATIONS
CONVENTIONAL ROUTERS
36
DIAL-UP ROUTERS
38
NETWORK MANAGEMENT SYSTEM
37

FIGURE 2a

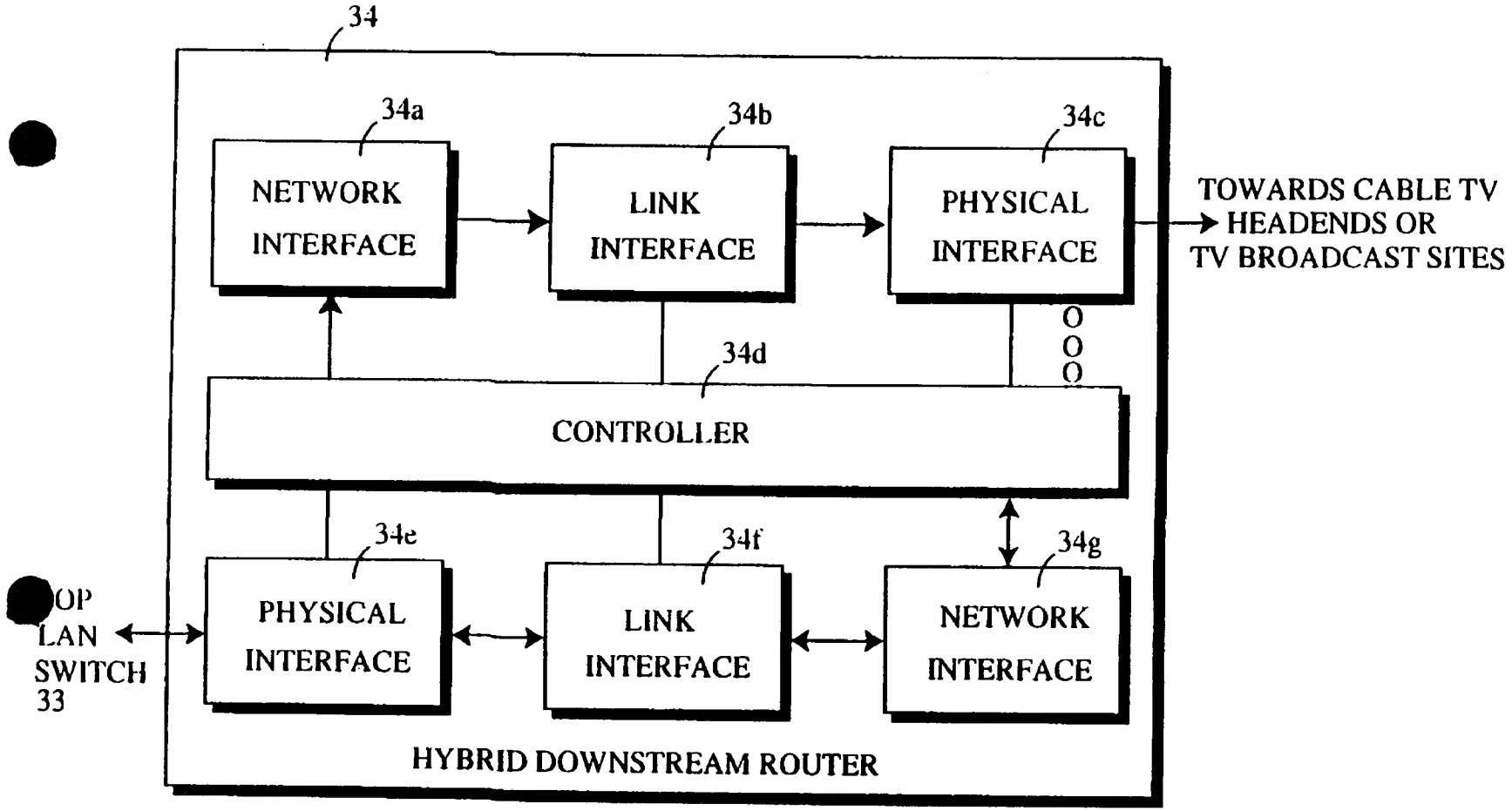
34
34a
NETWORK INTERFACE
34b
LINK INTERFACE
34c
PHYSICAL INTERFACE
TOWARDS CABLE TV HEADENDS OR TV BROADCAST SITES
34d
CONTROLLER
34e
PHYSICAL INTERFACE
34f
LINK INTERFACE
34g
NETWORK INTERFACE
OP
LAN
SWITCH
33
HYBRID DOWNSTREAM ROUTER

FIGURE 2b

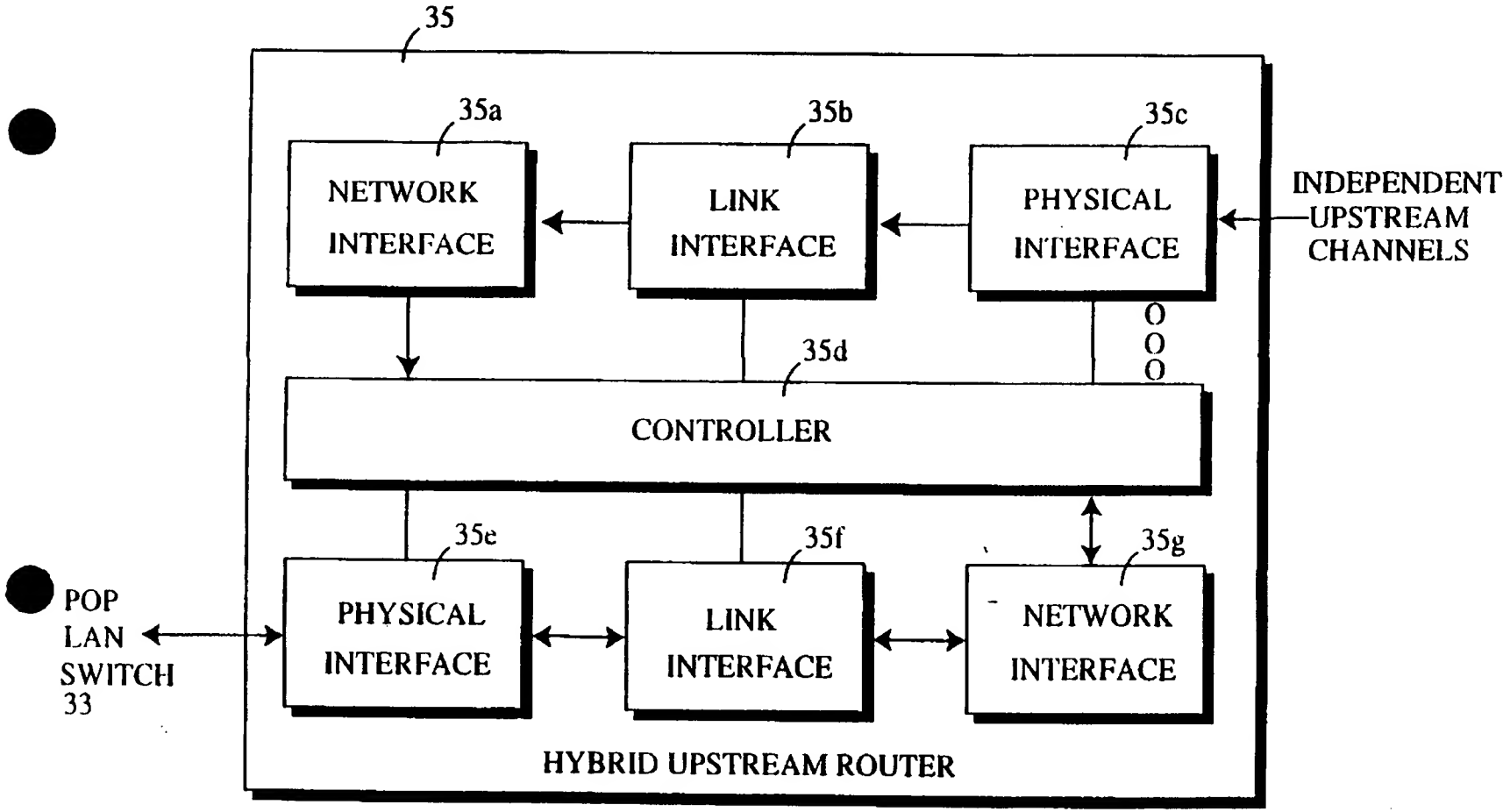
35
35a
35b
35c
NETWORK INTERFACE
LINK INTERFACE
PHYSICAL INTERFACE
INDEPENDENT UPSTREAM CHANNELS
O O O
35d
CONTROLLER
35e
35f
35g
POP LAN SWITCH 33
PHYSICAL INTERFACE
LINK INTERFACE
NETWORK INTERFACE
HYBRID UPSTREAM ROUTER

FIGURE 2c

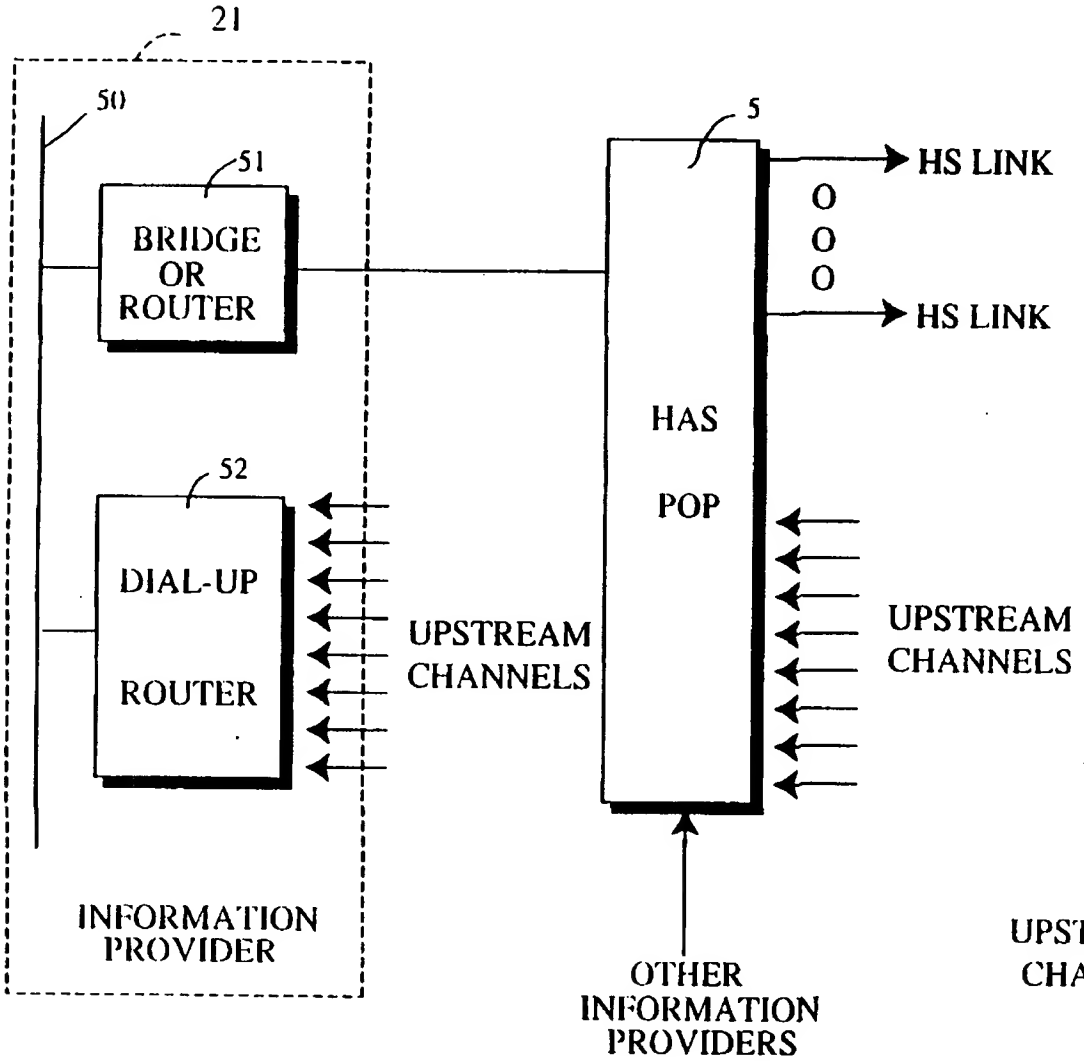

FIGURE 3a

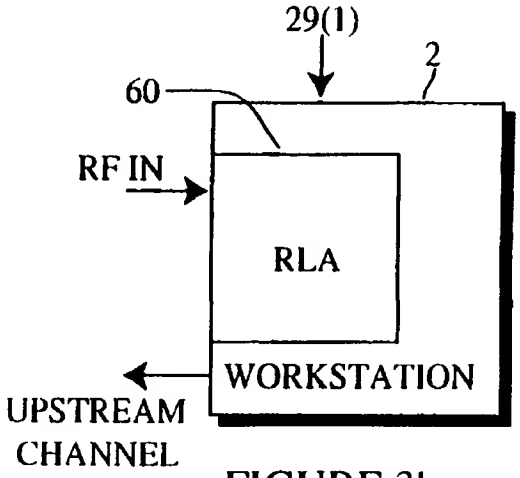

FIGURE 3b

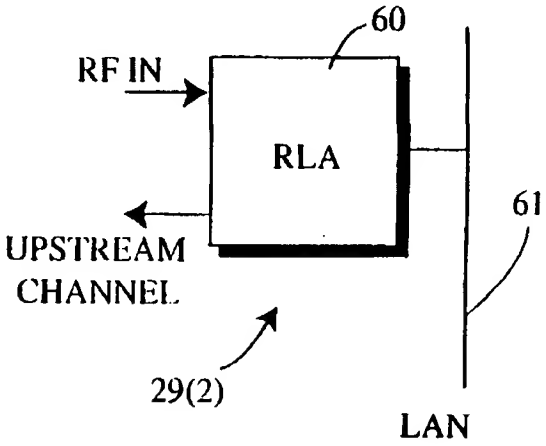

FIGURE 3c

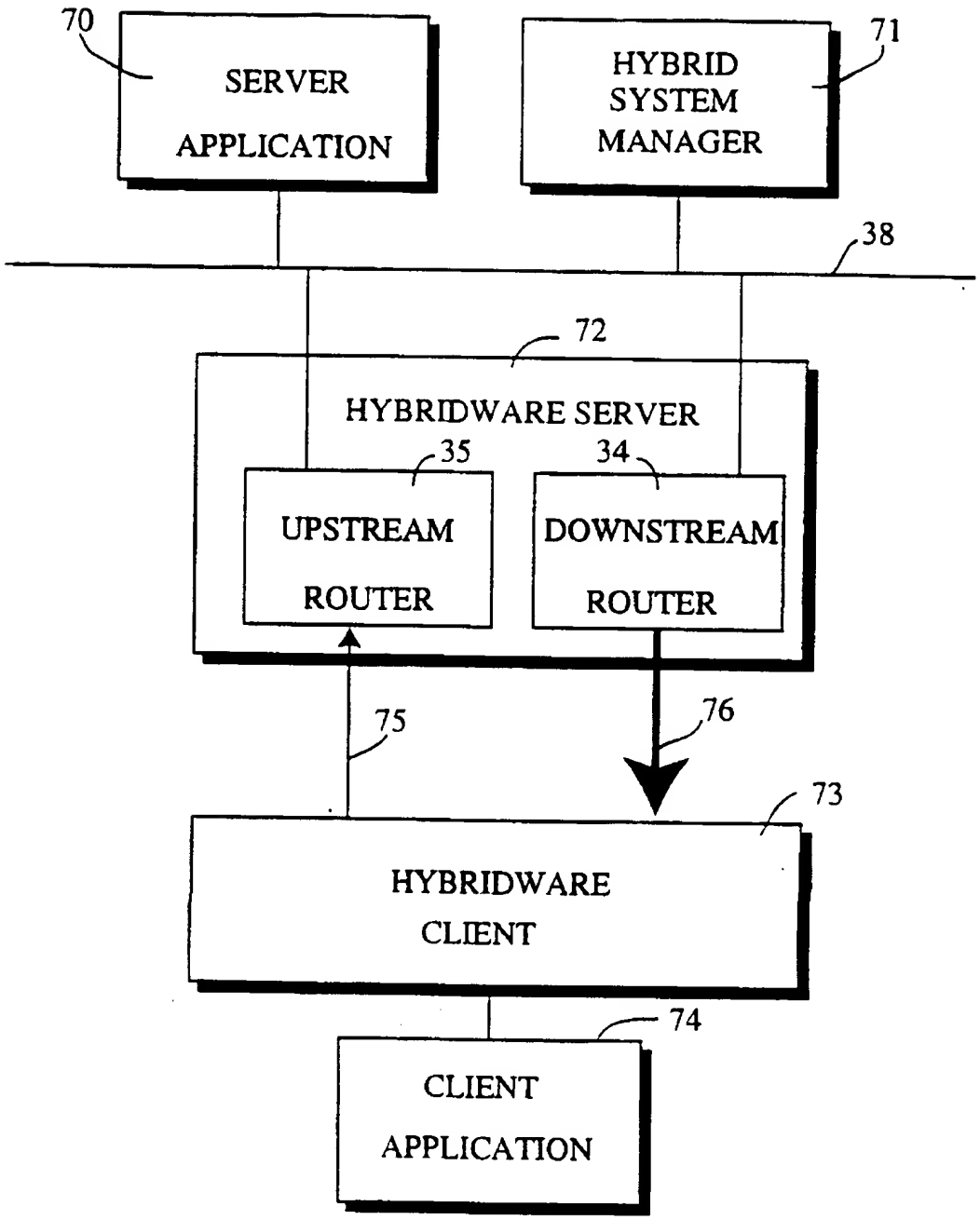
70
SERVER APPLICATION
71
HYBRID SYSTEM MANAGER
38
72
HYBRIDWARE SERVER
35
34
UPSTREAM ROUTER
DOWNSTREAM ROUTER
75
76
73
HYBRIDWARE CLIENT
74
CLIENT APPLICATION

FIGURE 4

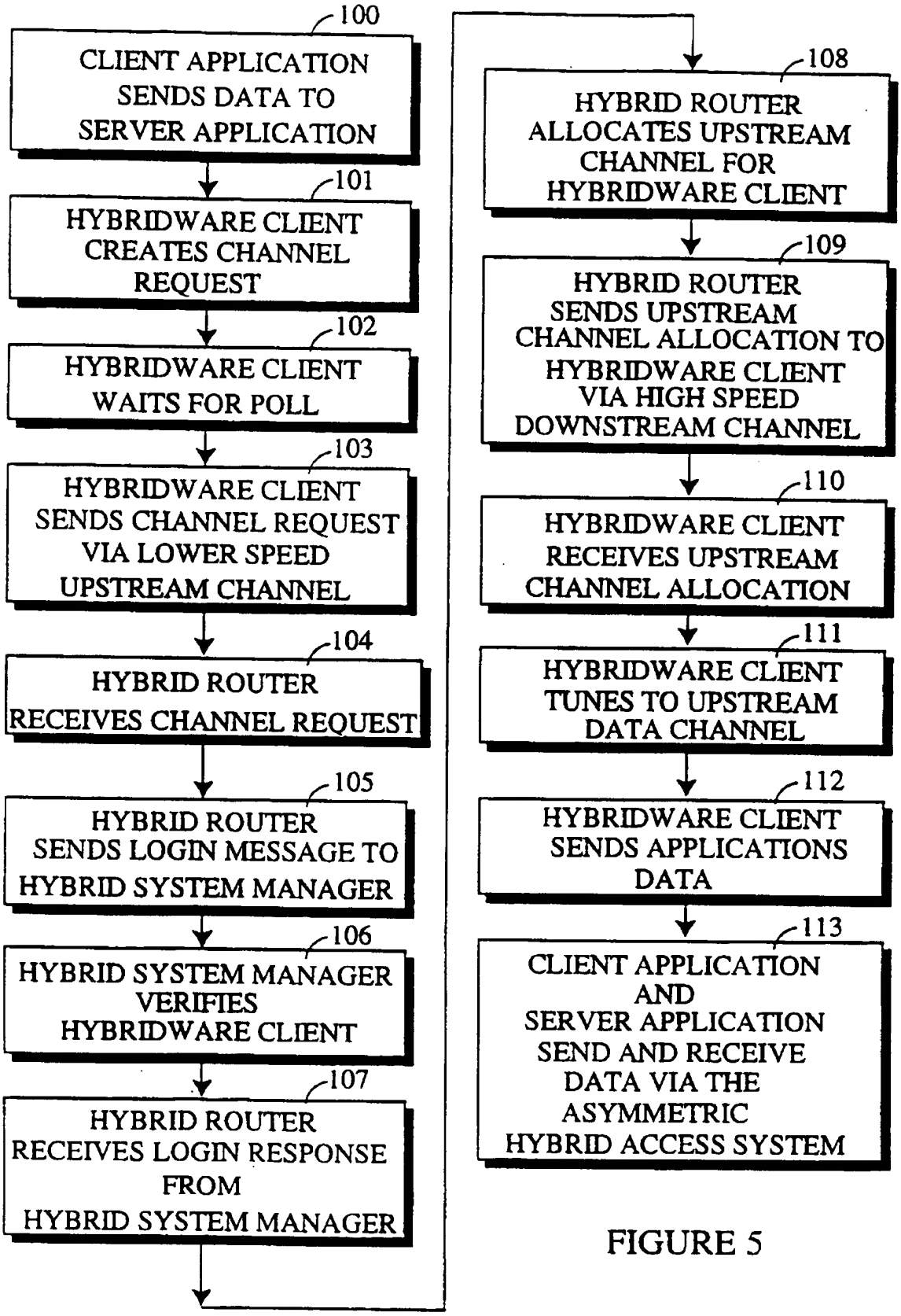
100
CLIENT APPLICATION SENDS DATA TO SERVER APPLICATION
101
HYBRIDWARE CLIENT CREATES CHANNEL REQUEST
102
HYBRIDWARE CLIENT WAITS FOR POLL
103
HYBRIDWARE CLIENT SENDS CHANNEL REQUEST VIA LOWER SPEED UPSTREAM CHANNEL
104
HYBRID ROUTER RECEIVES CHANNEL REQUEST
105
HYBRID ROUTER SENDS LOGIN MESSAGE TO HYBRID SYSTEM MANAGER
106
HYBRID SYSTEM MANAGER VERIFIES HYBRIDWARE CLIENT
107
HYBRID ROUTER RECEIVES LOGIN RESPONSE FROM HYBRID SYSTEM MANAGER
108
HYBRID ROUTER ALLOCATES UPSTREAM CHANNEL FOR HYBRIDWARE CLIENT
109
HYBRID ROUTER SENDS UPSTREAM CHANNEL ALLOCATION TO HYBRIDWARE CLIENT VIA HIGH SPEED DOWNSTREAM CHANNEL
110
HYBRIDWARE CLIENT RECEIVES UPSTREAM CHANNEL ALLOCATION
111
HYBRIDWARE CLIENT TUNES TO UPSTREAM DATA CHANNEL
112
HYBRIDWARE CLIENT SENDS APPLICATIONS DATA
113
CLIENT APPLICATION AND SERVER APPLICATION SEND AND RECEIVE DATA VIA THE ASYMMETRIC HYBRID ACCESS SYSTEM

FIGURE 5

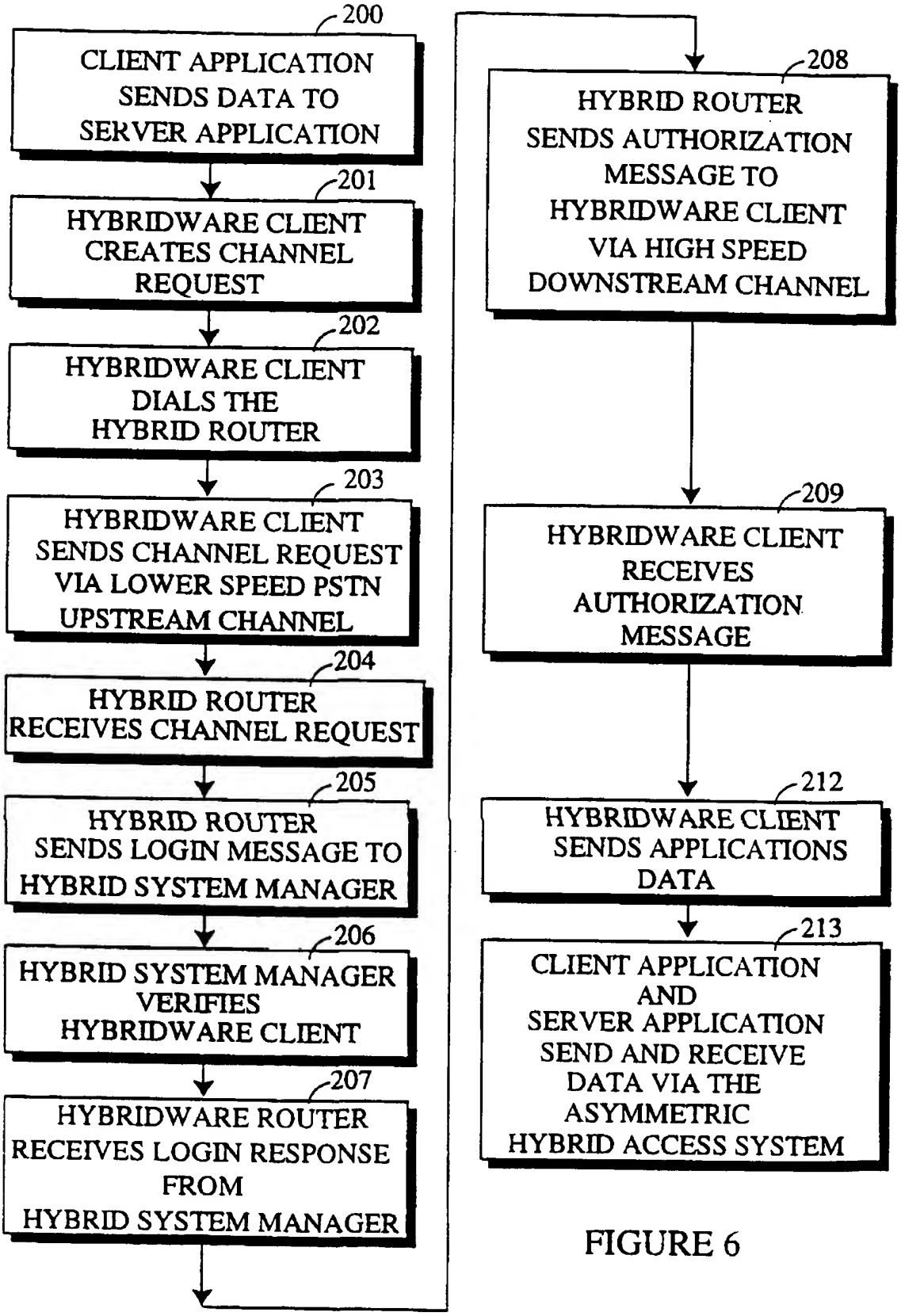
200
CLIENT APPLICATION SENDS DATA TO SERVER APPLICATION
201
HYBRIDWARE CLIENT CREATES CHANNEL REQUEST
202
HYBRIDWARE CLIENT DIALS THE HYBRID ROUTER
203
HYBRIDWARE CLIENT SENDS CHANNEL REQUEST VIA LOWER SPEED PSTN UPSTREAM CHANNEL
204
HYBRID ROUTER RECEIVES CHANNEL REQUEST
205
HYBRID ROUTER SENDS LOGIN MESSAGE TO HYBRID SYSTEM MANAGER
206
HYBRID SYSTEM MANAGER VERIFIES HYBRIDWARE CLIENT
207
HYBRIDWARE ROUTER RECEIVES LOGIN RESPONSE FROM HYBRID SYSTEM MANAGER
208
HYBRID ROUTER SENDS AUTHORIZATION MESSAGE TO HYBRIDWARE CLIENT VIA HIGH SPEED DOWNSTREAM CHANNEL
209
HYBRIDWARE CLIENT RECEIVES AUTHORIZATION MESSAGE
212
HYBRIDWARE CLIENT SENDS APPLICATIONS DATA
213
CLIENT APPLICATION AND SERVER APPLICATION SEND AND RECEIVE DATA VIA THE ASYMMETRIC HYBRID ACCESS SYSTEM

FIGURE 6

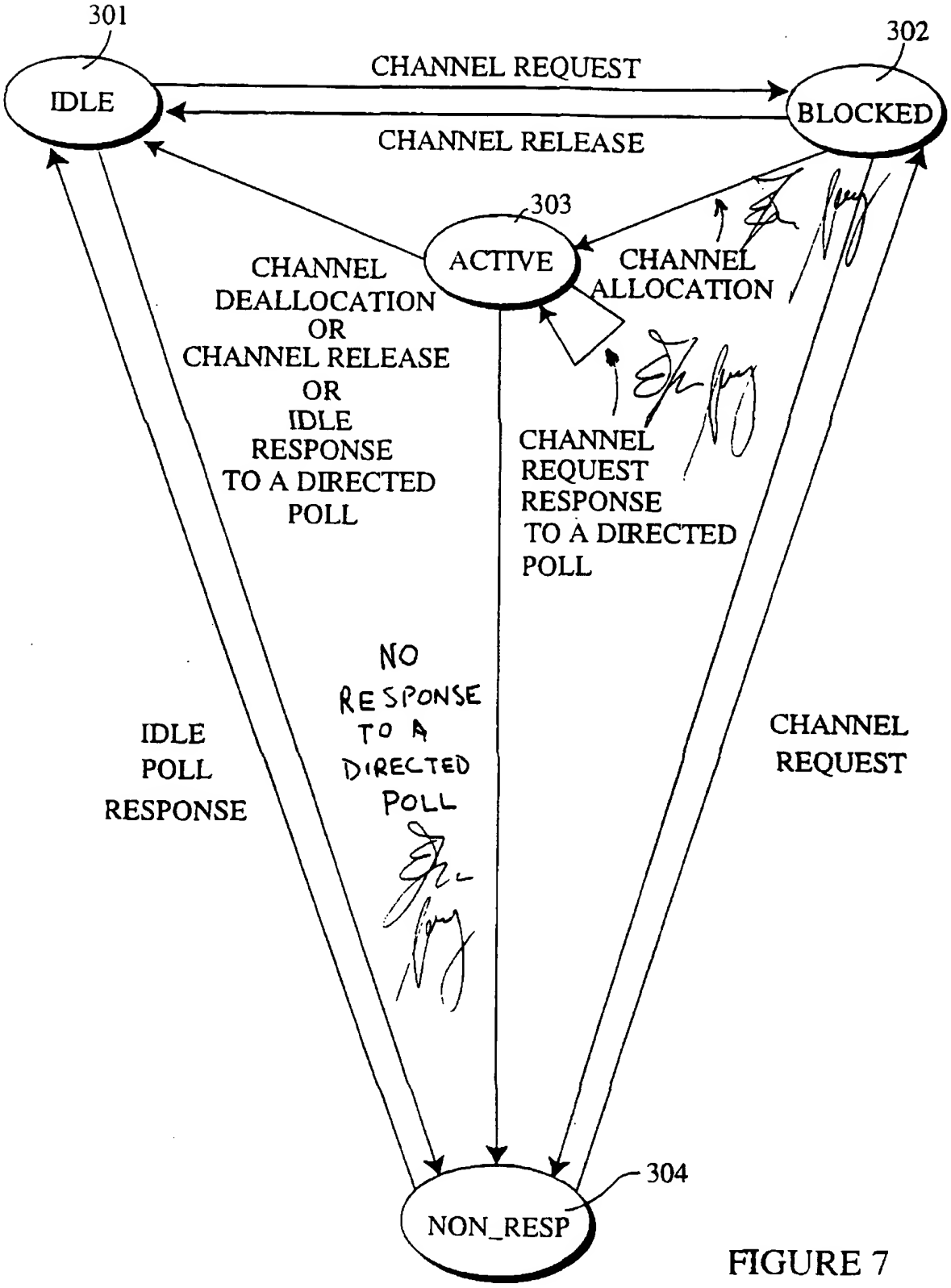
301
IDLE
CHANNEL REQUEST
CHANNEL RELEASE
302
BLOCKED
303
ACTIVE
CHANNEL DEALLOCATION OR CHANNEL RELEASE OR IDLE RESPONSE TO A DIRECTED POLL
CHANNEL ALLOCATION
CHANNEL REQUEST RESPONSE TO A DIRECTED POLL
NO RESPONSE TO A DIRECTED POLL
IDLE POLL RESPONSE
CHANNEL REQUEST
304
NON_RESP

FIGURE 7

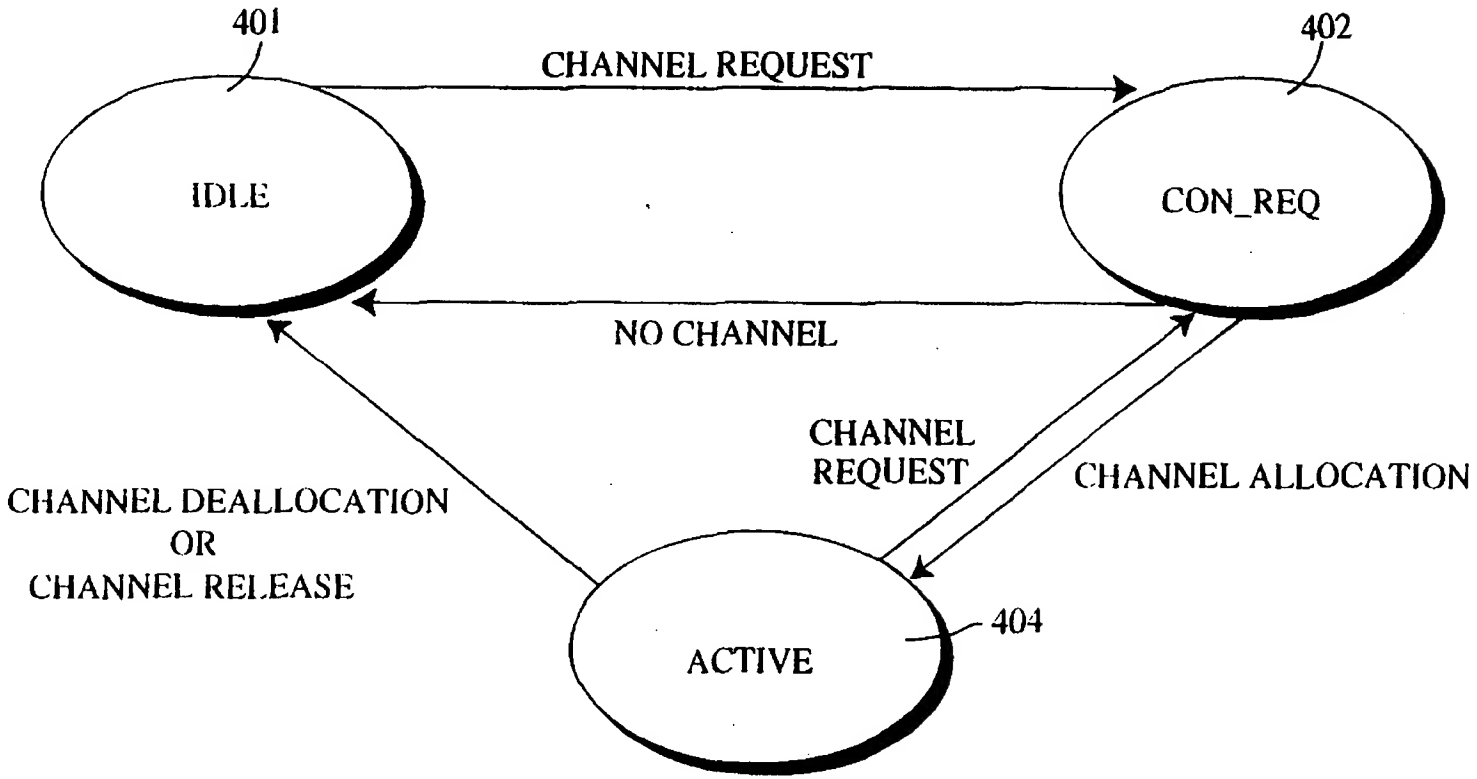
401
CHANNEL REQUEST
402
IDLE
CON_REQ
NO CHANNEL
CHANNEL
REQUEST
CHANNEL ALLOCATION
CHANNEL DEALLOCATION
OR
CHANNEL RELEASE
404
ACTIVE

FIGURE 8

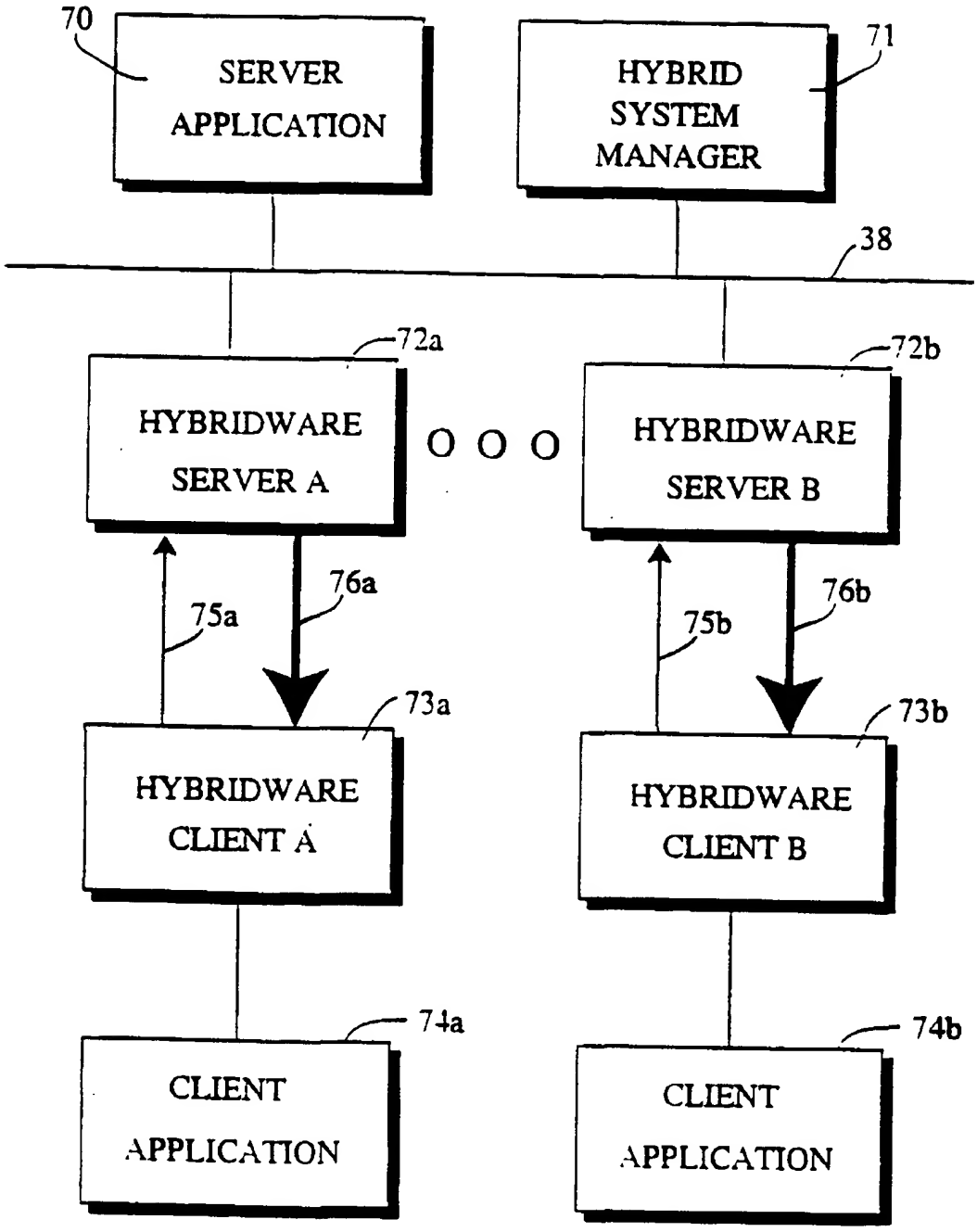
70
SERVER APPLICATION
71
HYBRID SYSTEM MANAGER
38
72a
HYBRIDWARE SERVER A
O O O
72b
HYBRIDWARE SERVER B
75a
76a
75b
76b
73a
HYBRIDWARE CLIENT A
73b
HYBRIDWARE CLIENT B
74a
CLIENT APPLICATION
74b
CLIENT APPLICATION

FIGURE 9

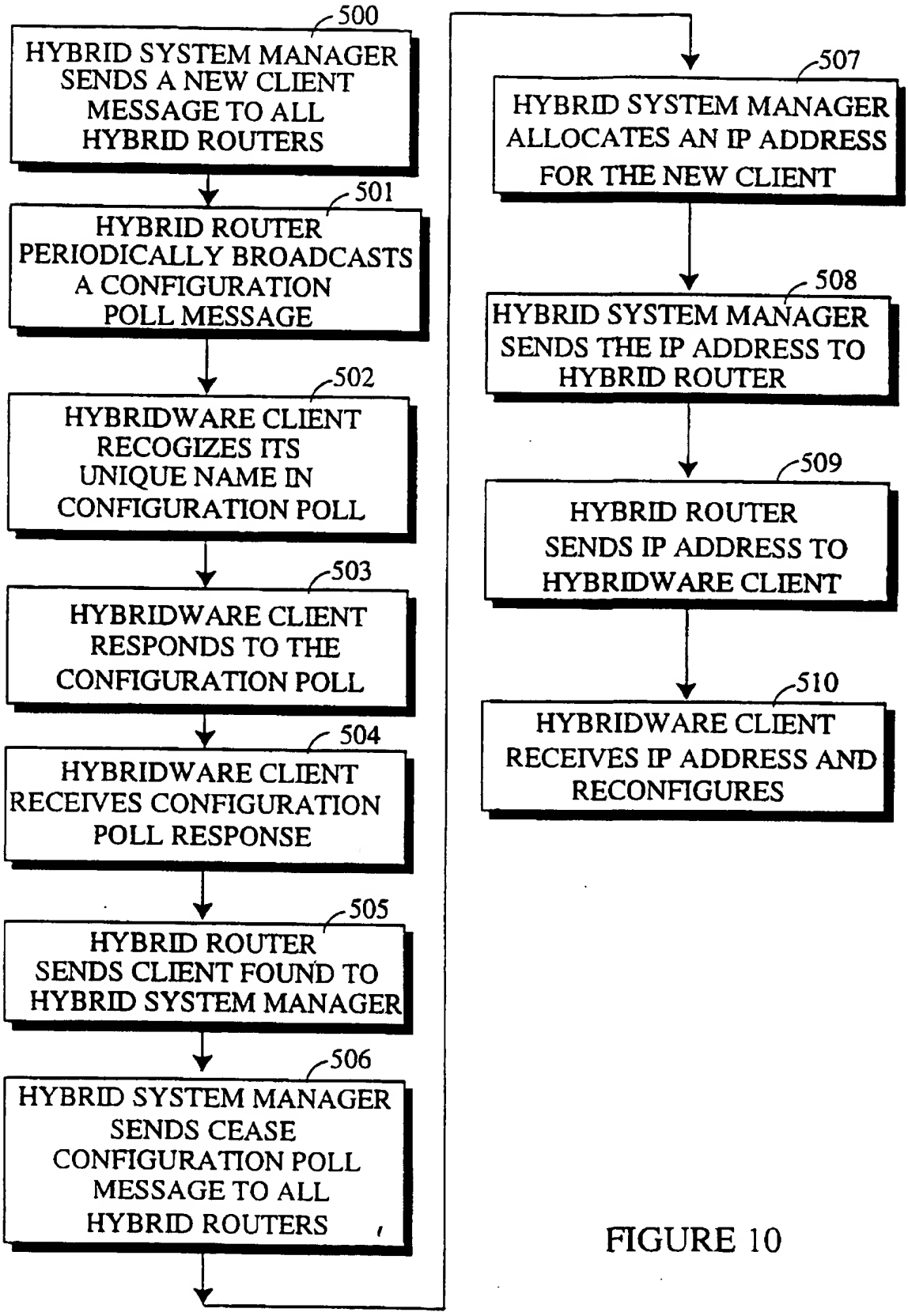
500
HYBRID SYSTEM MANAGER SENDS A NEW CLIENT MESSAGE TO ALL HYBRID ROUTERS
501
HYBRID ROUTER PERIODICALLY BROADCASTS A CONFIGURATION POLL MESSAGE
502
HYBRIDWARE CLIENT RECOGIZES ITS UNIQUE NAME IN CONFIGURATION POLL
503
HYBRIDWARE CLIENT RESPONDS TO THE CONFIGURATION POLL
504
HYBRIDWARE CLIENT RECEIVES CONFIGURATION POLL RESPONSE
505
HYBRID ROUTER SENDS CLIENT FOUND TO HYBRID SYSTEM MANAGER
506
HYBRID SYSTEM MANAGER SENDS CEASE CONFIGURATION POLL MESSAGE TO ALL HYBRID ROUTERS
507
HYBRID SYSTEM MANAGER ALLOCATES AN IP ADDRESS FOR THE NEW CLIENT
508
HYBRID SYSTEM MANAGER SENDS THE IP ADDRESS TO HYBRID ROUTER
509
HYBRID ROUTER SENDS IP ADDRESS TO HYBRIDWARE CLIENT
510
HYBRIDWARE CLIENT RECEIVES IP ADDRESS AND RECONFIGURES

FIGURE 10

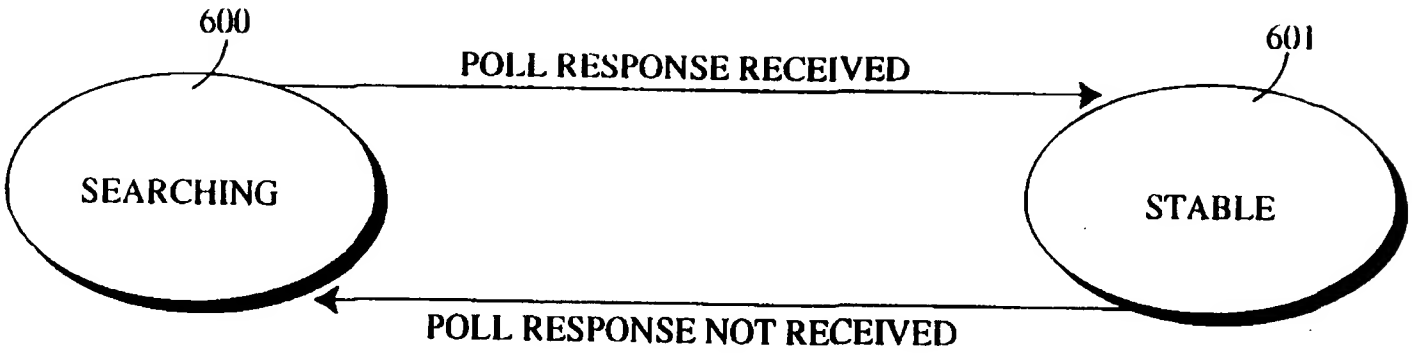
600
601
POLL RESPONSE RECEIVED
SEARCHING
STABLE
POLL RESPONSE NOT RECEIVED

FIGURE 11

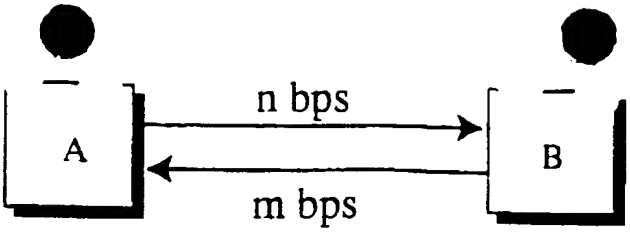

FIGURE 12a
PRIOR ART

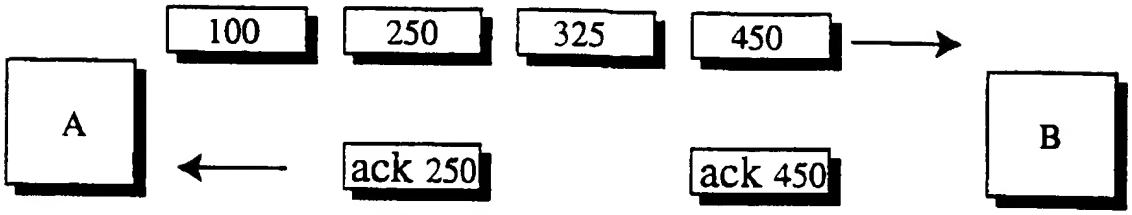

FIGURE 12b
PRIOR ART

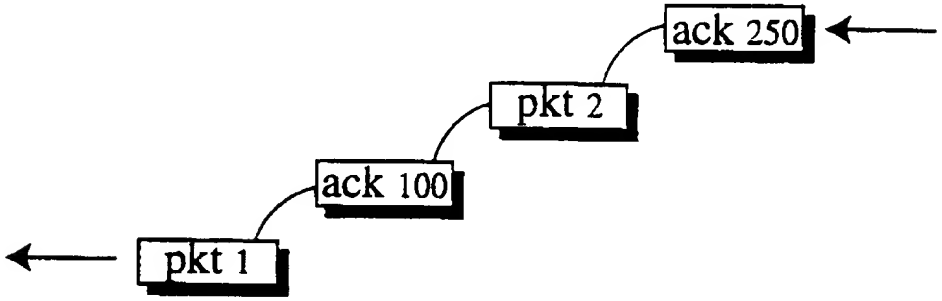

FIGURE 12c

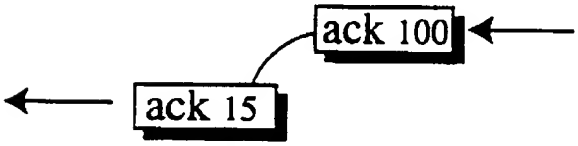

FIGURE 12d

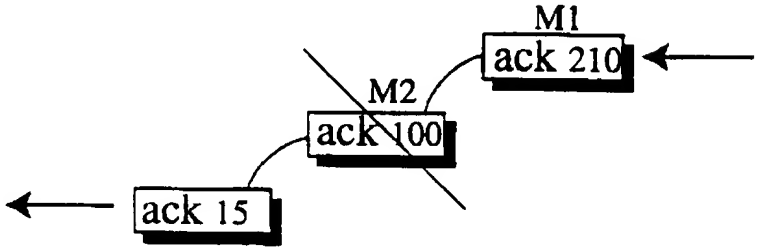

FIGURE 12e

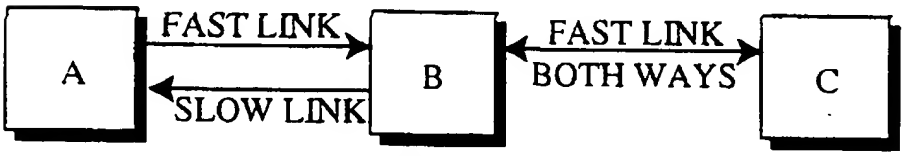

FIGURE 12f

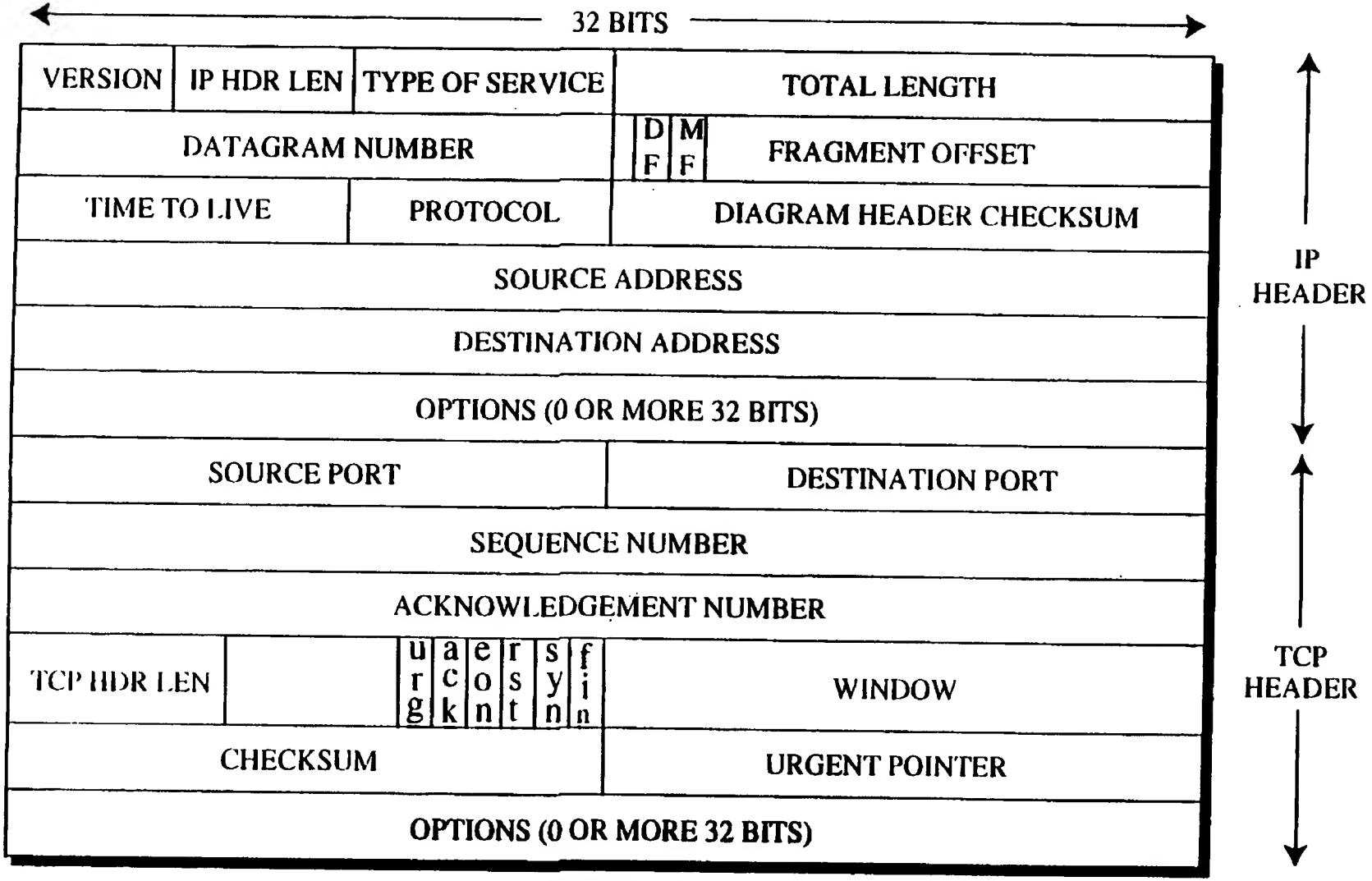
32 BITS
VERSION
IP HDR LEN
TYPE OF SERVICE
TOTAL LENGTH
DATAGRAM NUMBER
DF
MF
FRAGMENT OFFSET
TIME TO LIVE
PROTOCOL
DIAGRAM HEADER CHECKSUM
SOURCE ADDRESS
DESTINATION ADDRESS
OPTIONS (0 OR MORE 32 BITS)
SOURCE PORT
DESTINATION PORT
SEQUENCE NUMBER
ACKNOWLEDGEMENT NUMBER
TCP HDR LEN
urg
ack
eon
rst
syn
fin
WINDOW
CHECKSUM
URGENT POINTER
OPTIONS (0 OR MORE 32 BITS)
IP HEADER
TCP HEADER

FIGURE 13

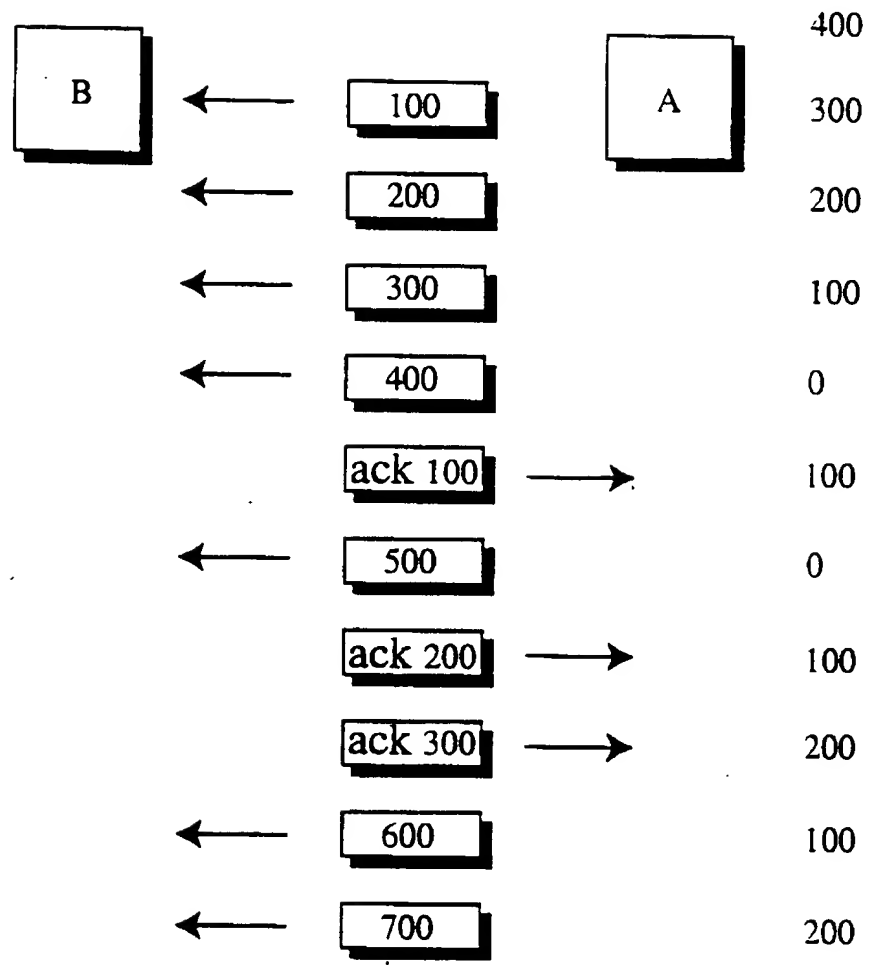

FIGURE 14a

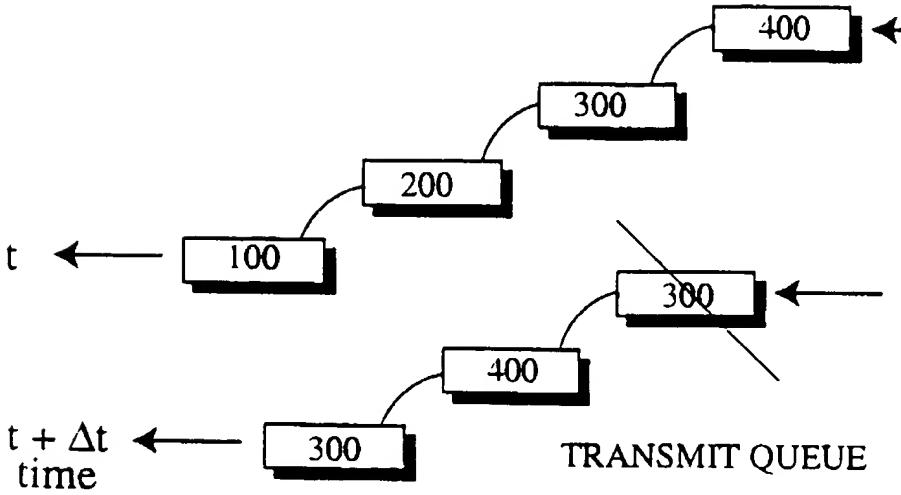

FIGURE 14b

FIGURE 14c

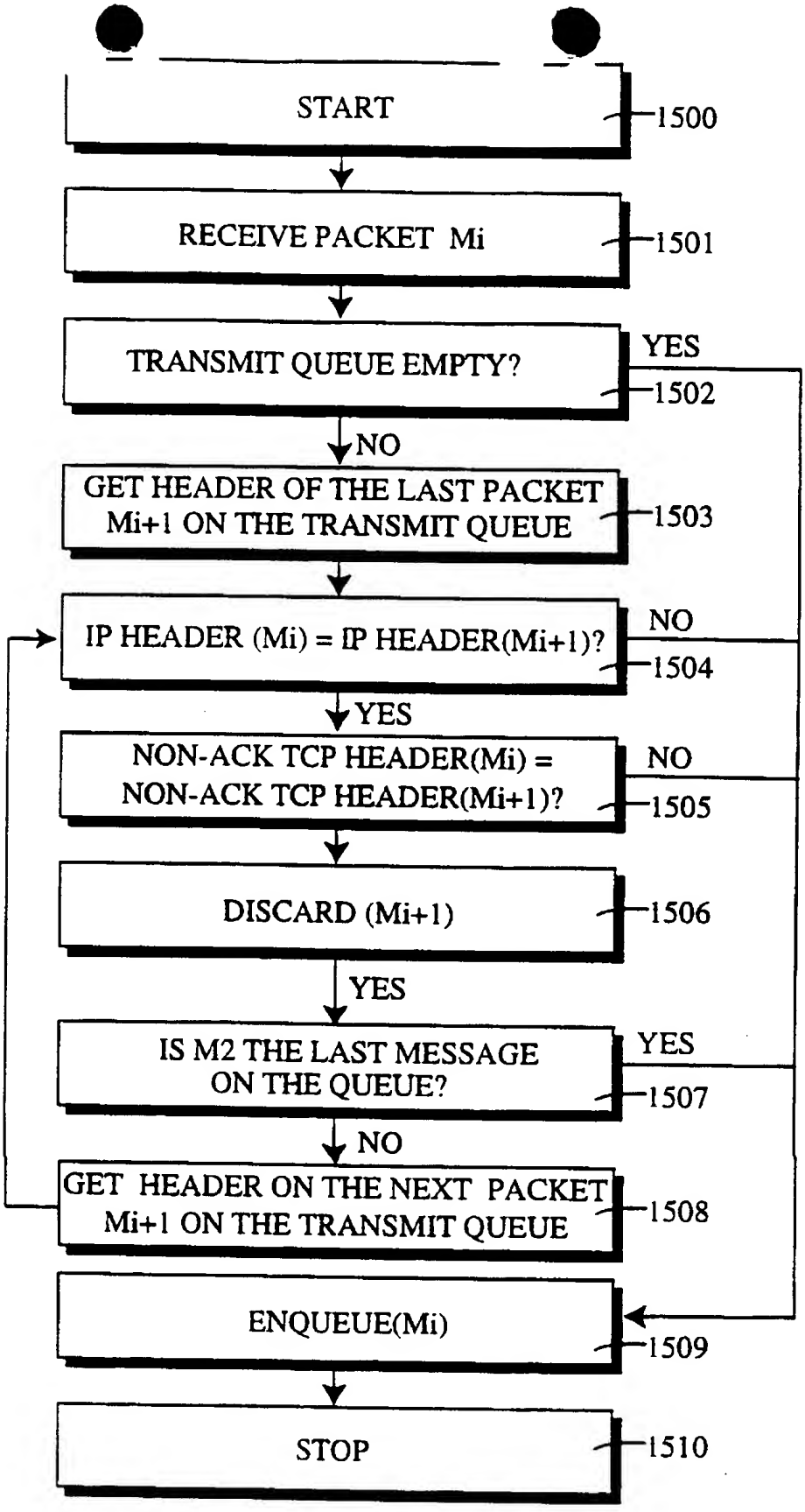
START
1500
RECEIVE PACKET Mi
1501
TRANSMIT QUEUE EMPTY?
YES
1502
NO
GET HEADER OF THE LAST PACKET Mi+1 ON THE TRANSMIT QUEUE
1503
IP HEADER (Mi) = IP HEADER(Mi+1)?
NO
1504
YES
NON-ACK TCP HEADER(Mi) = NON-ACK TCP HEADER(Mi+1)?
NO
1505
DISCARD (Mi+1)
1506
YES
IS M2 THE LAST MESSAGE ON THE QUEUE?
YES
1507
NO
GET HEADER ON THE NEXT PACKET Mi+1 ON THE TRANSMIT QUEUE
1508
ENQUEUE(Mi)
1509
STOP
1510

FIGURE 15

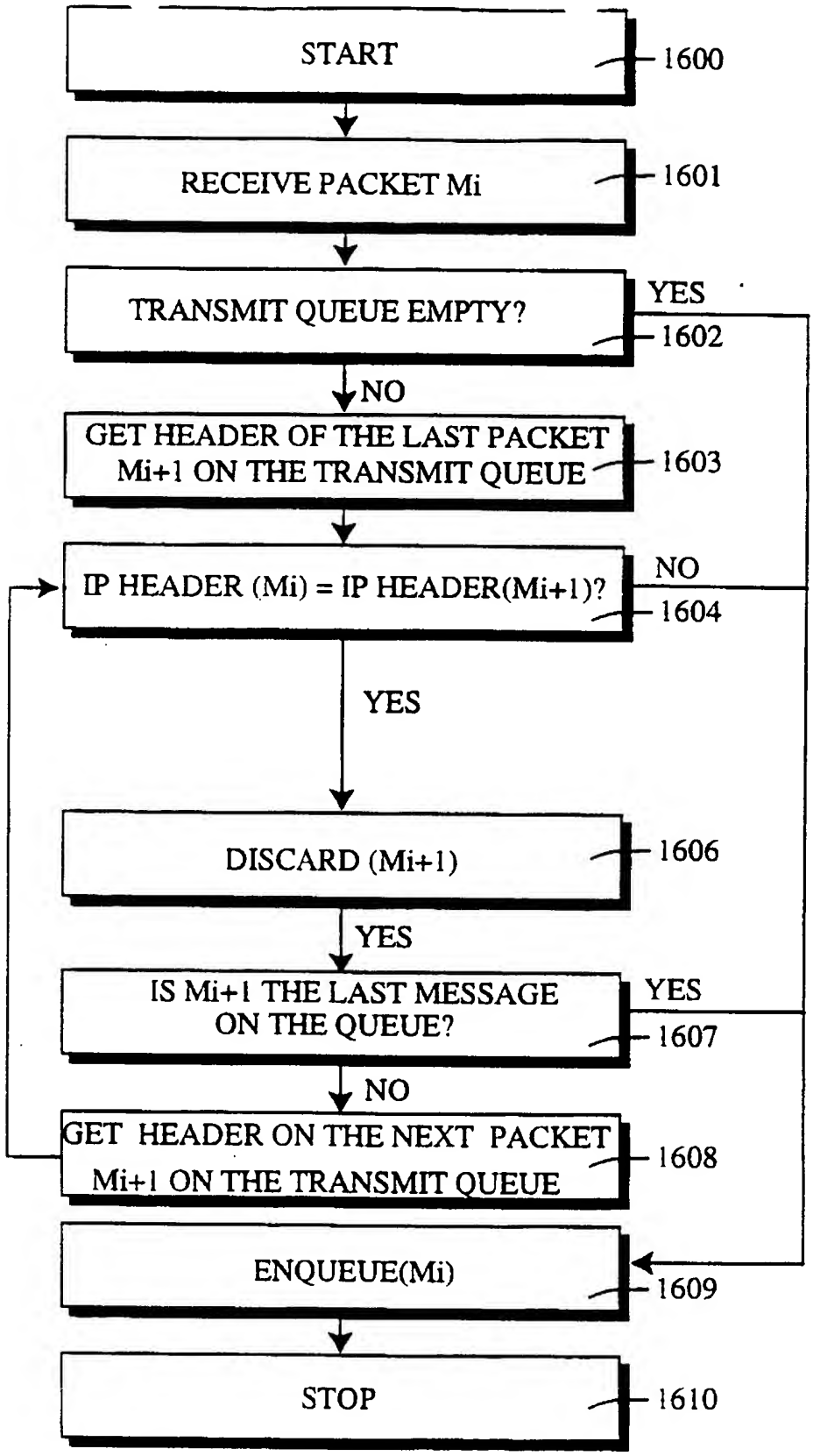
START
1600
RECEIVE PACKET Mi
1601
TRANSMIT QUEUE EMPTY?
YES
1602
NO
GET HEADER OF THE LAST PACKET Mi+1 ON THE TRANSMIT QUEUE
1603
IP HEADER (Mi) = IP HEADER(Mi+1)?
NO
1604
YES
DISCARD (Mi+1)
1606
YES
IS Mi+1 THE LAST MESSAGE ON THE QUEUE?
YES
1607
NO
GET HEADER ON THE NEXT PACKET Mi+1 ON THE TRANSMIT QUEUE
1608
ENQUEUE(Mi)
1609
STOP
1610

FIGURE 16

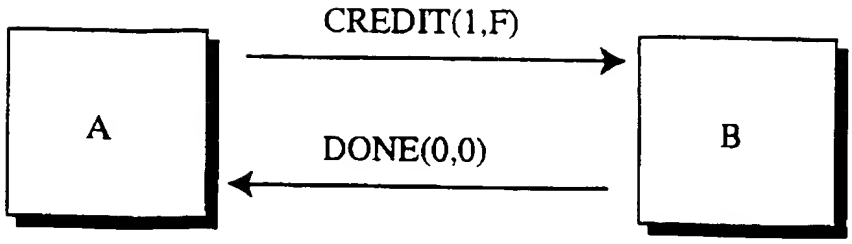

FIGURE 17

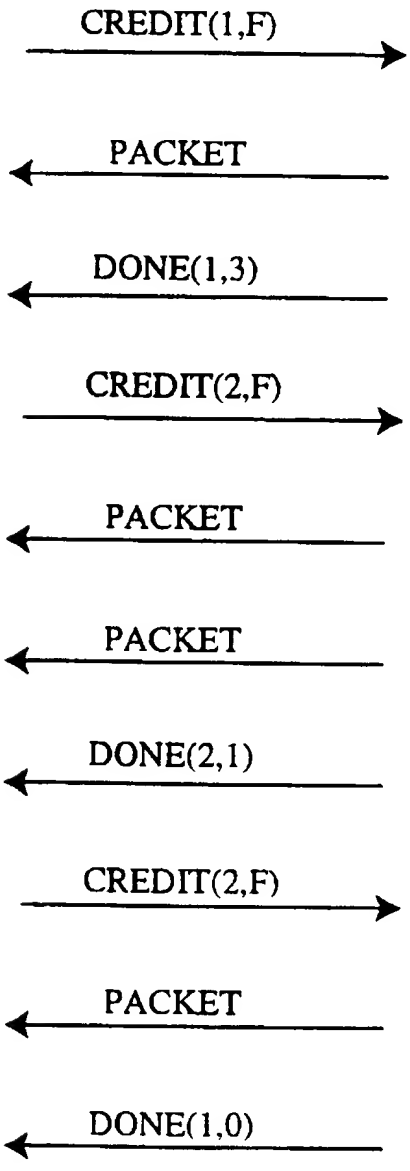

FIGURE 18

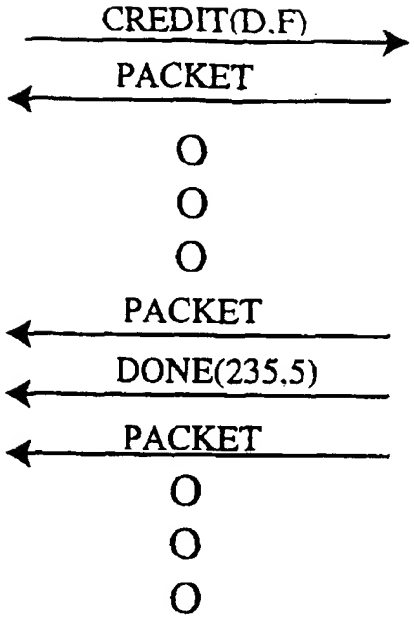

FIGURE 19

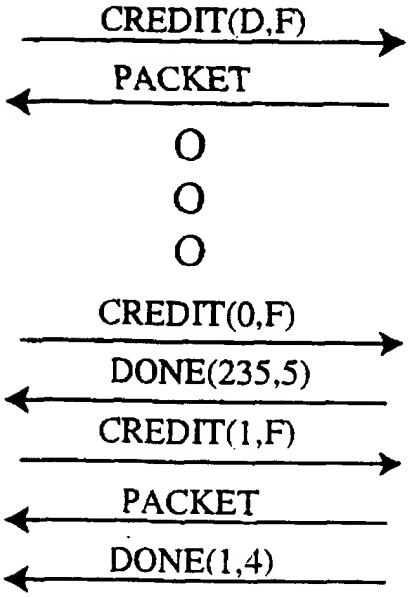

FIGURE 20

EXHIBIT

Attny.Dkt.No.: 1572
Applicants: Eduardo J. Moura and Jan Maksymiliam Gronski
Serial No.: Unknown
Filed: On Even Date Herewith
Title: ASYMMETRIC HYBRID ACCESS SYSTEM AND METHOD

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9 (f) and 1.27 (c)) - SMALL BUSINESS CONCERN

I hereby declare that I am:

[ ] the owner of the small business concern identified below:

[X] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Hybrid Networks, Inc.
ADDRESS OF CONCERN 10201 Bubb Road, Cupertino, CA 95014

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.2--18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the above referenced invention described in

[X] the specification filed herewith [ ] application identified above [ ] patent identified above

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventors, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

*NAME _____
ADDRESS _____
[ ] INDIVIDUAL [X] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of the Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

SIGNATURE _____ DATE 4/21/95
NAME OF PERSON SIGNING RICHARD E. FULLER
TITLE OF PERSON OTHER THAN OWNER VP, FINANCE
ADDRESS OF PERSON SIGNING 10201 BUBB RD., CUPERTINO, CA 95014

EXHIBIT C

PATENT
ATTORNEY DOCKET No. 27459-803/767

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:)
)
MOURA et al.)
)
Application No. 08/703,767)
)
Filed: August 27, 1996)
)
For: HYBRID ACCESS SYSTEM)
UTILIZING CREDIT/DONE)
PROTOCOLS)
)

Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

DECLARATION OF FREDERICK ENNS IN SUPPORT OF PETITION

I, FREDERICK ENNS declare that:

1. I am currently Vice President and Chief Technical Officer, Hybrid Networks, Inc.

2. Hybrid Networks, Inc. has always had less than 500 employees.

3. In 1993, a large corporation, having more than 500 employees, wished to develop and market PC card products to provide users of personal computers with cable connectivity. (In this declaration, this large corporation will be called ACME, though ACME is not the actual name of this corporation.) To further that goal, ACME agreed to transfer money to Hybrid by way of a Technology License Agreement executed November 30, 1993 (portions of which are attached to this Declaration). Two years later, on December 26, 1995, the parties amended and restated the November 30, 1993 Technology License Agreement.

4. ACME owned various amounts of Hybrid's stock from time to time. At no time did Acme own greater than 17% of Hybrid's stock.

5. Hybrid and ACME envisioned an arrangement in which ACME would manufacture PC card devices for use in individual computers, paying Hybrid a per-unit royalty fee. As a precursor to this arrangement, the agreements set forth a per-unit royalty fee payment schedule.

6. The November 30, 1993 agreement, executed by Hybrid President, Howard Strachman, was entitled TECHNOLOGY LICENSE AGREEMENT BETWEEN HYBRID NETWORK, INC. AND ACME CORPORATION, and was memorialized in 18 pages, portions of which are attached to this declaration.

7. The corporate department of Fenwick & West represented Hybrid in its dealing with ACME. Fenwick & West also had a patent department, but in November 1993 Hybrid was relying on Townsend & Townsend for patent prosecution matters.

8. After a period of consideration and consultation, Fenwick & West was formally retained as Hybrid's patent counsel in 1994.

9. On December 22, 1995, Hybrid's Vice President, Richard E. Fuller, executed a document entitled AMENDED AND RESTATED TECHNOLOGY LICENSE AGREEMENT BETWEEN HYBRID NETWORKS, INC. AND ACME, portions of which are attached to this declaration.

10. In a letter dated, February 26, 1996, signed by Hybrid's President, Carl. S. Ledbetter, the December 1995 Restated and Amended Agreement was amended as follows:

> The first two sentences of Section 10.4 shall be deleted and the following sentences shall be substituted in their place:

> The parties will prepare a development plan based upon such product specifications as may be mutually agreed upon by the [redacted] Team consisting of Hybrid, ACME, Beta Corporation and Delta Corporation. The parties to the Agreement agree to negotiate in good faith the terms and conditions of a Development Agreement under which such development will occur. Hybrid has received in accordance with Section 6.3 any ACME Improvements developed by ACME as of the Effective Date. On July 1, 1996 ACME will make additional delivery to Hybrid of any ACME Improvements developed by ACME subsequent to the Effective Date.

(The paragraph above employs the names BETA and DELTA to identify two other large corporations, though BETA and DELTA is not the actual name of these corporations.)

11. In order to expedite prosecution of its patent matters, Hybrid retained Farkas & Manelli in or about February 1996 to handle some of its matters, and later transferred all of its patent matters to Farkas & Manelli. Over the past few months, Hybrid began to consult with Farkas & Manelli on its business and financial matters including prospective licensing of its technologies, whereupon Hybrid and Farkas & Manelli worked together on contract and licensing issues for Hybrid.

12. Recently, Hybrid consulted its current representative, Farkas & Manelli, relative to licensing its technology to ACME in connection with ACME's prospective sale of a business unit dealing with Hybrid's technology. The current representative on or about October 28, 1997 inquired of Hybrid whether the ACME licensing deal had gone through. At that time, I informed the present representative that it had not, and, during the discussions, I informed the representative that the recent negotiations with ACME were based on an earlier agreement, to wit: the November 30, 1993 agreement (which had been restated and modified on December 26, 1995). At the request of the representative, I then had a copy of the 1993 agreement forwarded

to the representative, by facsimile. On November 17-18, 1997, the representative visited Hybrid in Cupertino, California to explore further the nature of the relationship between Hybrid and ACME. During that visit, Hybrid informed the representative that the November 30, 1993 agreement had been restated and modified on December 26, 1995, and again modified on February 26, 1996. On November 18, 1997, Hybrid obtained a copy of the restated and amended agreement from Farkas & Manelli, and forwarded the same to its current representative.

13. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

By: _____

Frederick Enns

_____

Date

ATTACHMENT TO DECLARATION OF FREDERICK ENNS
PORTIONS OF AGREEMENT EXECUTED NOVEMBER 30, 1993

3.3 . . . As a condition precedent to ACME's obligation to pay under Sections 3.2 and 3.3, Hybrid, with ACME's cooperation, shall engage in commercially reasonable development efforts as mutually agreed and defined by the Parties in a separate development agreement which the parties agree to negotiate in good faith and which shall include installment by Hybrid by of an agreed number of Point of Presence Systems.

The agreement included the following provisions for the purchase of Hybrid assets and stock by ACME:

13.0 ACME RIGHT OF FIRST REFUSAL

13.1 If Hybrid decides to (i) sell itself, merge, consolidate, sell all, or substantially all of its assets, or (iii) issue, sell or exchange, for cash or other consideration, shares of its capital stock (each a "Corporate Event"), the result of which will be a change in control of Hybrid. Hybrid shall give ACME a detailed, written description of the terms of the proposed Corporate Event at least forty-five (45) days prior to the completion of the Corporate Event (the "Notice").

13.2 Upon receipt of the Notice, ACME shall have the right, exercisable by giving written notice to Hybrid within thirty (30) calendar days after the date of delivery of the Notice, to enter into an agreement with Hybrid to participate in the Corporate Event on terms consistent with and no less favorable to Hybrid than those contained in the Notice. If the consideration contained in the Notice includes property other than cash, ACME shall have the option to substitute similar property of equal value. The value of any property included in the purchase price shall be the fair market value of such property on the date ACME receives the Notice. In the event of a disagreement between the Parties, the fair market value of property shall be jointly determined by a nationally recognized investment firm selected by each Party to this Agreement. If the firms selected by ACME and Hybrid are unable to agree upon the value of property, the firms shall promptly select a third firm whose determination shall be conclusive. Each Party shall bear the cast of its own investment banking firm and shall share equally the cost of any third firm selected hereunder. If ACME exercises its right to purchase under this Section 13.0, the transactions shall (i) be subject to the receipt of all applicable regulatory approvals, (ii) be in compliance with applicable laws and regulations, and (iii) take place on such date and at such time and place as Hybrid and ACME shall mutually agree, provided that in no event will such date be later than forty-five (45) days after the date of the Notice.

13.3 If ACME decides not to participate in the Corporate Event as detailed in the

Notice, Hybrid may complete the corporate Event as detailed in the Notice. If the terms and conditions of the Corporate Event materially change after expiration of ACME's rights under Paragraph 13.2 and such terms are more favorable than those first detailed in the Notice, Hybrid must inform ACME in writing of such changes and ACME shall have the right, within ten (10) workings days of receiving such notification from Hybrid to agree to complete within thirty (30) days after such notification, the Corporate Event on the changed terms and conditions specified in Hybrid's notification to ACME.

13.4 ACME shall maintain the right of first refusal under this Section 13.0 during the Exclusivity Period. ACME's right of first refusal shall continue after expiration or termination of the Exclusivity Period for the earlier of (i) two (2) years, provided ACME holds at least ten percent (10%) of Hybrid's outstanding shares of stock at the time of the Corporate Event of (ii) an initial public offering by Hybrid.

The agreement also included the following license grant provisions:

1.5 "Hybrid Software" shall mean Hybrid's client software, in source and binary form, to be installed on a user's computing device which permits symmetrical/asymmetric data communications between the user's personal computer or other computing device and a cable television of other communications network. A Point of Presence System shall not be included in the term "Hybrid Software."

1.6 "Hybrid Technology" shall mean Hybrid's designs, processes, methods, software, algorithms, trade secrets, and its patents, copyrights, and other ACME intellectual property rights used in or necessary for Hybrid Software and/or the Remote Link Adapter with respect to enabling symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network.

1.7 "Point of Presence System" shall mean a central network point for the collection of digital information from various information providers and users and the distribution of digital information to the cable television head-end equipment.

1.9 "Remote Link Adapter" shall mean a device that uses software and/or hardware to physically connect a personal computer or other computing device to a television cable or other communications network and which is capable of executing Hybrid Software. A Point of Presence System shall not be included in the term "Remote Link Adapter." . . .

2.0 LICENSE GRANT

2.1 Subject to the terms of this Agreement, hybrid grants to ACME a perpetual,

worldwide, exclusive (as defined in Section 2.4), royalty bearing license, with the right to sublicense during the Exclusivity Period (as defined in Section 2.4), to use Hybrid Technology . . .

2.2 Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, exclusive (as defined in Section 2.4), royalty free license, with the right to sublicense, during the Exclusivity Period (as defined in Section 2.4) under Hybrid's copyrights, patents, and trade secrets to reproduce copies of Hybrid Software . . .

2.5 Except as expressly provided herein, no other rights or licenses of any kind are granted by the Parties. . . .

ATTACHMENT TO DECLARATION OF FREDERICK ENNS
PORTIONS OF AGREEMENT EXECUTED DECEMBER 22, 1995

THEREFORE, ACME and Hybrid agree as follows:

I. Definitions

1.1. *"Hybrid Documentation"* shall mean written Hybrid specifications, schematics, and associated technical documentation for the Remote Link Adapter and Hybrid Software.

1.2 *"Hybrid Improvement"* shall mean any enhancement, feature, or option for use by or in connection with Hybrid Technology or the ACME Technology developed by Hybrid which is intended to, or which does, improve Hybrid Technology or the ACME Technology.

1.3 *"Hybrid Product"* shall mean a product developed by or for Hybrid which incorporates ACME Technology. ACME Improvement or any other derivative thereof.

1.4 *"Hybrid Software"* shall mean Hybrid's client software, in source and binary forms, to be installed on a user's computing device which permits symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network. A Point of Presence System shall not be included in the term "Hybrid Software."

1.5 *"Hybrid Technology"* shall mean Hybrid's designs, processes, methods, software, algorithms, trade secrets, and its patents, copyrights, and other ACME intellectual property rights used in or necessary for Hybrid Software and/or the Remote Link Adapter with respect to enabling symmetric/asymmetric data communications between the user's personal computer or other computing device and a cable television or other communications network. Hybrid Technology shall include any Hybrid improvements required to be delivered to ACME hereunder.

1.6 *"ACME Documentation"* shall mean written ACME specifications, schematics, and associated technical documentation for the ACME Technology.

1.7 *"ACME Improvement"* shall mean any enhancement, feature, or option for use by or in connection with ACME Technology or the Hybrid Technology developed by ACME which is intended to, or which does, improve ACME Technology or the Hybrid Technology.

1.8 *"ACME Product"* shall mean a product developed by or for ACME which incorporates Hybrid Technology, Hybrid Improvement or any other derivative thereof.

1.9 *"ACME Software"* shall mean the "ACME Client Software Modifications," the "ACME [redacted] Client Software" and the "ACME [redacted] Software," as each is defined in Exhibit A, in source and binary forms.

1.10 *"ACME Technology"* shall mean the portions of the ACME Technology Deliverables that were developed by ACME. The ACME Technology shall not include those portions of the ACME Technology Deliverables that incorporate any of the Hybrid Technology. The ACME Technology shall include (without limitation) the "ACME [redacted] Software" as defined in Exhibit A.

1.11 *"ACME Technology Deliverables"* shall mean the ACME Software and the "ACME [redacted] Client Hardware" as defined in Exhibit A. The ACME Technology Deliverables shall include the ACME Improvements required to be delivered to Hybrid hereunder. ACME acknowledges that the ACME Technology Deliverables incorporate portions of the Hybrid Technology.

1.12 *"Point of Presence System"* shall mean a central network point for the collection of digital information from various information providers and users and the distribution of digital information to the cable television head-end equipment for a specific geographic area.

1.13 *"Remote Link Adapter"* shall mean a device that uses software and/or hardware to physically connect a personal computer or other computing device to a television cable or other communications network and which is capable of executing Hybrid Software. A Point of Presence System shall not be included in the term "Remote Link Adapter."

2. LICENSE GRANTS

2.1 Hybrid Technology. Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, nonexclusive, royalty bearing license to use Hybrid Technology to design, develop, modify, create derivatives, manufacture, have manufactured, use, marker, distribute, sell, service and support ACME Products. ACME shall not sublease any Hybrid Technology. These licenses include the right to copy, modify, and distribute Hybrid Documentation.

2.2 Hybrid Software. Subject to the terms of this Agreement, Hybrid grants to ACME a perpetual, worldwide, nonexclusive, royalty-free license, under Hybrid's copyrights, patents, and trade secrets, to reproduce copies of Hybrid Software in order to prepare derivative works of such Hybrid Software ("*ACME Derivative Code*") and to copy, publish, and distribute, under ACME's then current standard licensing terms, Hybrid Software and ACME Derivative Code in binary form. ACME shall not sublease Hybrid Software or ACME Derivative Code in source code form. These licenses include the right to copy, modify, and distribute Hybrid Documentation.

2.3 ACME Technology. Subject to the terms of this Agreement, ACME grants to Hybrid a perpetual, worldwide, nonexclusive, royalty-free, paid-up license to use ACME Technology to design, develop, modify create derivatives, manufacture, have manufactured, use, market, distribute, sell, service and support Hybrid Products. Hybrid shall not sublicense ACME

Technology. These licenses include the right to copy, modify, and distribute ACME Documentation.

2.4 ACME Software. Subject to the terms of Agreement, ACME grants to Hybrid a perpetual, worldwide, nonexclusive, royalty-free license, under ACME 's copyrights, patents, and trade secrets, to reproduce copies of ACME Software in order to prepare derivative works of such ACME Software ("*Hybrid Derivative Code*") and to copy, publish, and distribute, under Hybrid's then current standard licensing terms, ACME Software and Hybrid Derivative Code in binary form. Hybrid shall not sublicense ACME Software or Hybrid Derivative Code in source code form. These licenses include the right to copy, modify, and distribute ACME Documentation.

2.6 Distribution in Devices. Notwithstanding the software licenses restrictions specified in this Section 2, each party shall have the right to distribute software or portions thereof which are programmed into a semiconductor device without a license agreement but will rely on such laws as may be appropriate.

2.7 Reserved Rights ... Except as expressly provided herein, no other rights or licenses of any kind are granted by the parties.

4. OWNERSHIP

4.1 Hybrid Ownership. Except for the licenses expressly granted in Section 2 above, Hybrid will remain the owner of all right, title and interests in the Hybrid Technology, Hybrid Software, Hybrid Documentation and any and all copyright, trade secret, patent and other intellectual property rights therein. Except for ACME's ownership of the ACME Technology, Hybrid will remain the owner of all right, title and interest in the Hybrid Products, Hybrid Improvements and any and all copyright, trade secret, patent and other intellectual property rights therein.

4.2 ACME Ownership. Except for the licenses expressly granted in Section 2 above, ACME will remain the owner of all right, title and interest in the ACME Technology, ACME Documentation and any and all copyright, trade secret, patent and other intellectual property rights therein. Except for Hybrid's ownership of the Hybrid Technology, ACME will remain the owner of all right, title and interest in the ACME Products, ACME Technology Deliverables, ACME Improvements and any and all copyright, trade secret, patent and other intellectual property rights therein ...

6. DEVELOPMENT, DELIVERY, MAINTENANCE AND SUPPORT

6.1 Hybrid Deliverables. Hybrid has delivered to ACME Hybrid Technology including but not limited to (i) all source code, "make files," and related Hybrid Documentation needed to recreate the executable version of the Hybrid Software, and (ii) the functional,

electrical, mechanical and test specifications, logic and wiring diagrams, physical layout diagrams, and bill of materials for the Remote Link Adapter.

6.2 Hybrid Improvements. Hybrid will furnish to ACME, in a form reasonably satisfactory to ACME and at no additional expense to ACME, only such Hybrid Improvements to Hybrid Technology as Hybrid shall have developed that maintain basic functionality, including cable back-channel capability. If Hybrid makes available to any third party the right to sell, lease, license or distribute any Improvement that increases functionality with respect to any ACME Product then marketed by ACME , Hybrid will furnish such improvement to ACME under terms and conditions as favorable as those offered by Hybrid to any such party.

6.3 ACME Deliverables. On or about the Effective Date and as otherwise agreed herein, ACME will deliver to Hybrid the ACME Technology Deliverables in the form of mutually agreed technology release packages including but not limited to (I) all source code, "make files," and related ACME Documentation needed to recreate the executable version of any software delivered, and (ii) the functional, electrical, mechanical and test specifications, logic and wiring diagrams, physical layout diagrams, and bill of materials for hardware delivered.

10. MARKETING AND FUTURE BUSINESS OPPORTUNITIES

10.1 Marketing Names. ACME shall have the right to promote and market Hybrid Technology under ACME's trade names, and Hybrid shall have the right to promote and market ACME Technology under Hybrid's trade names.

10.4 [redacted] Development Plan. During the sixty (60) days following the Effective Date, the parties will prepare a development plan relating to the [redacted] technology and will negotiate in good faith the terms and conditions of a Development Agreement under which such development will occur. If the parties do not develop such a development plan or enter into such a Development Agreement, ACME will deliver to Hybrid in accordance with Section 6.3 any ACME Improvements developed by ACME and on July 1, 1996, ACME will make an additional delivery to Hybrid of any ACME Improvements. Further, on July 1, 1996 and as otherwise agreed, if the parties enter into a Development Agreement, ACME will deliver to Hybrid any deliverables developed hereunder. Neither party will have liability whatsoever, and neither party will be considered to have breached this Agreement, for failure to prepare a development plan or enter into a Development Agreement.

13.1 If Hybrid decides to (I) sell itself, merge, consolidate, sell all, or substantially all of its assets, or (iii) issue, sell or exchange, for cash or other consideration, shares of its capital stock (each a "Corporate Event"), the result of which will be a change in control of Hybrid. Hybrid shall give ACME a detailed, written description of the terms of the proposed Corporate Event at least forty-five (45) days prior to the completion of the Corporate Event (the "Notice").

13.2 Upon receipt of the Notice, ACME shall have the right, exercisable by giving

written notice to Hybrid within thirty (30) calendar days after the date of delivery of the Notice, to enter into an agreement with Hybrid to participate in the Corporate Event on terms consistent with and no less favorable to Hybrid than those contained in the Notice.

EXHIBIT D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT application of
MOURA et al.

Group Art Unit: 2603

Application No. 08/703,767

Examiners: Hom & Olms

Filed: August 27, 1996

Our Deposit Acct. No. 06-0115
Order No. 27459-803

For: HYBRID ACCESS SYSTEM
USING CREDIT/DONE POLLING PROTOCOLS

Date: Monday, May 19, 1997

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

RESPONSE/AMENDMENT/LETTER

This is a response/amendment/letter in the above-identified application and includes the herewith attachment of same date and subject which is incorporated hereinto by reference and the signature below is to be treated as the signature to the attachment in absence of a signature thereto.

FEE REQUIREMENTS FOR CLAIMS AS AMENDED

"Small Entity" statement(s) filed

[X] previously

[ ] herewith (No.) [ ]

	Claims remaining after amendment	Highest number previously paid for		Present Extra	Large/Small Entity	Additional Fee
Total Effective Claims	27	**minus	20 =	7	x $22/$11 =	77
Independent Claims	9	***minus	3 =	6	x $78/$39 =	234
If amendment enters proper multiple dependent claim(s) into this application for first time (leave blank if this is a reissue application) . . . . . add					+$250/$125=	
Original due date: April 10, 1997			NONE			
Petition is hereby made to extend the original due date to cover the date this response is filed for which the requisite fee is attached			(1 mo) (2mos) (3mos)	$110/$55 = $380/$190= $900/$450=	+190	
Enter any previous extension fee paid since above original due date (item 5) and subtract					-	
					Extension Fee Attached	+190
If **Terminal Disclaimer** attached, add Rule 20(d) official fee					+ $110/$55=	+
If IDS attached requires Official Fee, ... add or if Rule 97(d) Petition, ... add					+ $220 = + $130 =	+
After-Final Request Fee per Rules 129(a) and 17(r)					+ $750/375=	+
No. of additional inventions for examination per Rule 129(b):					x$750/375ea=	+
Petition fee for						+
					TOTAL FEE ENCLOSED =	**$ 501**

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rul any overpayment, to our Account/Order Nos. shown in the heading hereof, for which purpose a duplicate copy of this sheet is attached.
This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed.

Farkas & Manelli, PLLC
2333 20th Street, N.W.
Suite 700
Washington, D.C. 20036-2396

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